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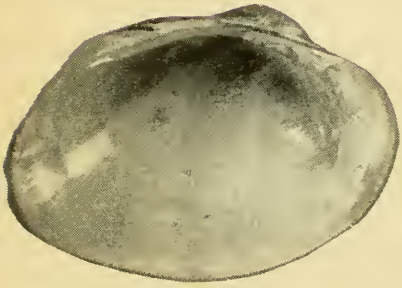

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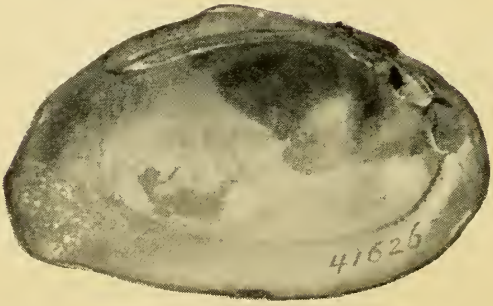

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1, 4. QUINCUNCINA BURKEI WALKER.
2, 3. NODULARIA CRONINÆ WALKER.

THE NAUTILUS.

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A NEW GENUS AND SPECIES OF AMERICAN NAIADES

BY A. E. ORTMANN AND BRYANT WALKER

The generic diagnosis, and the anatomical work on which it is based, was done by Ortmann. The determination of the specific distinctness of the form was made by Walker before any anatomical work had been done and the specific description has been prepared by him.

QUINCUNCINA Ortmann.

The genus *Quincuncina* is founded upon the new species *Quincuncina burkei* Walker. I have received from the late H. H. Smith from the Choctahatchee River, Blue Springs, Barbour County, Ala., several shells and the soft parts of seven other, five males, one barren and one gravid female, the latter collected May 12, 1915.

Supraanal opening present, separated from the anal by a short mantle-connection. Anal opening about as long as the supraanal, its inner edge finely crenulated. Branchial opening about as large as the anal with distinct papillæ. Palpi subfalciform, their posterior margins connected for about one-half of their length.

Gills of normal Unione shape and structure. Inner lamina of inner gill free from abdominal sac except at its anterior end. Since the gill is rather short, the connected portion is about

one-third the length of the abdominal sac. Gill diaphragm of the usual type.

Septa of the gills, in the male, moderately developed, not very closely set; in the female, *all four gills serve as marsupium*, and the septa are strongly developed and stand close together. When gravid, the gills do not swell much and the ovisacs (water-tubes) are filled with *subcylindrical* placentæ.

The gravid female at hand had only embryos in an early stage, but no glochidia. The color of the placentæ could not be ascertained in consequence of the preservation in alcohol, in which they appear grayish-white.

The most characteristic anatomical feature of the present species is found in the marsupium, which is formed by the *four gills*, and has *subcylindrical placentæ*. In these particulars it resembles only one genus, *Fusconaia*, and also the rest of the anatomy does not differ from that of this genus.

However, in shell characters, this species is distinct from all known species of *Fusconaia*. In the latter we never see any sculpture on the disk and the beak sculpture is quite poorly developed, simple and concentric. In *Quincuncina* we have a rather complex zig-zag sculpture on the shell, following the subconcentric beak-sculpture.

Certain species of *Quadrula* have indications of the sculpture (*Q. cylindrica*, for instance); but these species differ from the present one by the lanceolate and compressed placentæ. However, there are two species which have been placed in *Quadrula*, *U. infucatus* Conrad and *U. kleinianus* Lea, which have a sculpture much like that of *Quincuncina burkei*. Of *U. kleinianus*, Lea (Journ. Acad. Phila., 1863, p, 404, and Obs. 10, 1863) has described the soft parts and, so far as the description goes, it agrees very well with the present species, except that the inner lamina of the inner gill is said to be free only half the length of the abdominal sac and that the anal opening is described as smooth; these are very insignificant differences, indeed. The most important character mentioned by Lea is that all four gills of *kleinianus* are marsupial.

H. H. Smith has sent me the soft parts of two males of *infucatus*. Also here the anatomy is the same so far as can be

observed. The inner lamina of the inner gill agrees with *Q. burkei*, while the anal opening is smooth as in *U. kleinianus*.

It is more than probable that *U. infucatus* and *kleinianus* also belong to our new genus *Quincuncina*, the type of which is *Q. burkei*. It is a very primitive form of the subfamily *Unioninæ* and stands, in its anatomy, close to *Fusconaia*, from which it differs, however, by the very peculiar sculpture of the shell, which, indeed, is rather unique among North American Naiades.

The generic diagnosis of *Quincuncina* would be as follows: Soft parts of the type of the family *Unionidae*, subfamily *Unioninæ*, much like those of the genus *Fusconaia*. All four gills marsupial, when charged not much swelled, and with subcylindrical (not lanceolate and compressed) placentæ.

Shell sculptured. The beak sculpture subconcentric, and followed upon the disk by bars of zig-zag type extending to a considerable distance and being much broken up so as to offer, at least upon parts of the disk, a quincuncial arrangement of nodules.

QUINCUNCINA BURKEI Walker. Plate I, figs. 1 and 4.

Shell of moderate size, subrhomboid, very inequilateral, subsolid, somewhat inflated; beaks only slightly elevated above the hinge-line, their sculpture consisting of strong, subcircular ridges, stronger along the umbonal ridge and curved up sharply behind, fading out anteriorly and becoming nearly parallel with the growth-lines; anterior end regularly rounded; base line curved; posterior end somewhat produced, subtruncate, curving down rather abruptly and subangulated as it approaches the posterior point, which is below the median of the disk; posterior ridge strong and angulated by the junction of the surface ridges; posterior slope with strong ridges, curving upwards, extending from the posterior ridge to the posterior margin, these form a sharp angle on the posterior ridge with heavier ridges extending downward and forward, which become more or less broken and tuberculous toward the margin and much weaker on the anterior end where they assume a rather quincuncial arrangement; epidermis in mature shells black or sometimes dark brown, in young shells brown or occasionally greenish-

yellow, in which case obscure radial stripes of darker green are visible; pseudocardinals double in both valves; in the right valve the anterior is low and oblique, the posterior strong and erect; in the left valve the anterior is rather long and projects obliquely forward, the posterior is larger, erect and more or less split up; the laterals, two in the left valve and (usually) one in the right are only a little curved, that in the right valve is sometimes more or less inclined to be double; beak cavities not very deep nor compressed; anterior muscle scars well marked, the superior one deep and extending under the base of the anterior pseudocardinal; posterior muscle scars distinct, but not deeply impressed; nacre light purplish, deeper in the beak cavities and iridescent behind.

Length 51.4, height 31.5, diam. 18.5 mm.

Type locality, Sikes' Creek, a tributary of the Choctahatchee River, Barbour County, Ala. Also in the Choctahatchee River, Blue Springs; Pea River at Elamville, Clio and Flemings' Mill and Campbell's Creek near Clio, Barbour County, and Hurricane Creek, near Hartford, Geneva County, Ala.

Type, No. 41626, Coll. Walker. Cotypes in the Alabama State Museum and the Carnegie Museum.

This very distinct species was first discovered in the Pea River at Elamville, Ala., by Joseph B. Burke and is named after him by the request of the late H. H. Smith.

So far as known it is restricted to the Choctahatchee drainage system.

There is some variation in shape and considerable in sculpture shown in the series from the several localities listed above. As shown by the figure the type is quite distinctly biangulated at the posterior extremity, but in many specimens the upper angle disappears and the dorsal outline curves directly down to a sharp posterior point. The surface sculpture is some times nearly obsolete. This is quite marked in the shells from Hurricane Creek and the Pea River at Clio. On the other hand the series from Campbell's Creek are larger and have a much coarser sculpture than any of the other lots. The largest specimen seen is in this lot and measures 67.5 x 38 x 23 mm.

The species is extremely subject to erosion and for this reason

the type was selected from the series from Sikes' Creek, which were in much better condition than those from the Choctahatchee, which supplied the alcoholic material on which the generic diagnosis is based.

The description of the beak sculpture is based on a single young shell from the Pea River, which is nearly in perfect condition.

As stated in the generic diagnosis the affinities of this species lie clearly with *U. infucatus* Con. and *U. kleinianus* Lea. It differs from both in its more elongated shape and less compressed beak cavities. But the peculiar surface sculpture is the same in all.

NODULARIA CRONINÆ n. sp., Walker. Pl. I, figs. 2–3.

Shell of moderate size, oblong, subinflated, rather solid; beaks obtuse; situated at about one-third of the length from the anterior end, heavily radiately folded; anterior end regularly rounded; basal margin curved, fullest in the middle, more rapidly anteriorly and less so towards the posterior end; dorsal margin nearly straight to the end of ligament where it is obtusely angulated as it passes into the posterior margin, which is oblique, meeting the basal margin in a broadly-rounded point below the median line; posterior ridge low, rounded, wider and flatter as it approaches the posterior point; the posterior slope has a series of strong corrugations, which curve upwards to the posterior margin, the upper ones are prolongations of the beak sculpture, the lower ones are wider and more or less irregular and disappear below the median line; in front of the beaks is a series of small ridges curving upwards, the upper ones connected with the beak sculpture, the lower ones are not and gradually disappear before reaching the median line; the beak sculpture in the centre extends only a short distance from the incurving of the beaks; entire surface elsewhere smooth with very fine lines of growth; color brownish or reddish-yellow, slightly tinged with green towards the beaks and in that region with fine, radiating lines of a darker green than the general tinge; pseudocardinals in the left valve two, triangular, flattened, crenate, especially the inner one, on the edge, practically united

on the ligamental side, but separated below by an oblique groove, which receives the inner pseudocardinal of the right valve; pseudocardinals in the right valve two, the inner the larger and quite heavily crenated, the outer narrow and smooth; laterals two in the left valve and one in the right, rather slender and nearly straight; beak cavities deep; anterior muscle scars separate and impressed; posterior only slightly impressed; nacre salmon color, more intense towards the beaks, shading into bluish-white below the pallial line and at the ends where it is very iridescent.

Length (type), 42.1, height 28.5, diam. 19.2 mm.

Length (paratype), 38.3, height 24.3, diam. 17.6 mm.

Length (type), 100.00, height .677 %, diam. .456 %.

Length (paratype), 100.00, height .637 %, diam. 4595 %.

As shown by the comparative measurements the paratype is proportionately not quite so high and a little more inflated than the type as might well be expected from the fact that it is evidently a younger shell. The color is a brighter yellow, which extends to the basal margin, otherwise it is in all respects similar to the type.

Type locality, Zambesi River, at Mongu Sealu in the Barotze Valley, North Rhodesia.

Type, No. 59694, Coll. Walker. Paratype in the collection of Mrs. Howard of Somerset East, Cape Province.

Two specimens of this fine species were sent in by Mr. H. C. Burnup of Maritzburg, Natal, who received them from Mrs. Howard. They were collected by Mrs. Edwina Cronin after whom it is named.

It differs from all of the described African species in the distinctive sculpture of the anterior and posterior slopes.

In order to be sure that the species had not been already described I submitted photographs of the type to Dr. Louis Germain of the Museum d'Histoire Naturelle, Paris, the well-known authority on African mollusca, and he assures me that it is quite distinct from all of the described species.

OBSERVATIONS ON THE GENERA LEILA AND ANODONTITES

BY L. S. FRIERSON

The edentulous shells of South America, classed by Dr. Lea as *Anodonta*, were placed by Simpson (1900) in the two genera *Leila* and *Glabaris*, both of Gray.

The latter genus was subdivided into three sections: *Glabaris* proper, s. s., *Styganodon*, and *Virgula*.

This arrangement was practically retained in Simpson's Catalogue of 1914, but the generic name of *Glabaris* (with the typical section of course) was changed to *Anodontites* Bruguiere.

But because of the radical difference between the *Anodontites crispata* Brug., type of the last named genus, and the *Anodonta exotica* Lam., type of the displaced genus *Glabaris*, the two genera can scarcely be considered synonymous, though thus treated by Simpson, as shown.

As Ortmann has recently hinted (in Memoirs of the Carnegie Museum, Vol. VIII, 1921) the type of the section *Anodontites*, s. s., and that of the section *Styganodon* really belong to the same subgeneric group, and in consequence, when the genus *Anodontites* is adopted, the subgenus *Styganodon* must be dropped.

But as constituted by Simpson, in his two works, but notably in his Catalogue, the *Anodontites* is easily seen to be composed of radically diverse elements, and a need of segregating the units thereof into groups more closely and naturally allied *inter se*, becomes more and more apparent. This can be done expeditiously, and in the writer's opinion, most naturally, by the wholesale removal from the genus *Anodontites*, of the group whose leading member is, perhaps, the *Anodonta trapezialis* Lamarck, and placed them in the genus *Leila*.

This will be the more easily done since it will but in large measure restore the *status quo ante* Simpson; many conchologists having so written many, if not all of the species thus indicated.

The enlarged genus *Leila* will then embrace all of those South American *Naiades*, whose general outward appearance so closely resemble that of the North American *Anodonta grandis* Say.

These shells differ from the emended *Anodontites* in having shells of greater size, yet, in proportion, of thinner texture, and of greater inflation. Their coloring and polish of epidermis are also noticeable differences. Internally, they differ in a more or less sinuous post-pallial line. Most of all, probably, they are to be differentiated by the greater extension of the pallial line, beyond the posterior adductor muscle scar. In some instances this extension reaches the ligamental *sinus*. This extended pallial line may be noted in the figure given by Lea of his *Anodonta forbesiana;* and also in the recent figure given by Ortmann (Memoirs of the Carnegie Museum, Vol. VIII, 1921, Plate XLIV, Fig. 2) of the *Anodontites riograndensis* Ihering.

It is shown perfectly in a fine example of *Leila bahiensis* Kuster before me. Lastly, it is shown in a large specimen of *Leila trapezialis* Lamarck. It is likely that this feature follows from the usual gaping posteriors of the group, thus throwing the work of excluding undesirables from the cavity of the gill chambers, upon the post-mantle edges; this in turn brings about a development of the pallial muscles in that region, and the pallial line noted, evidences their presence.

The genus is naturally divided into two subgeneric groups.

Leila s. s. Type, *Anodonta blainvilliana* Lea.

Pseudoleila. Type, *Anodonta ciconia* Gould.

The latter section being proposed by Crosse & Fischer, 1893.

A study of the species listed in *Anodontites* leads to some conclusions at variance with those of the Catalogue and Synopsis. Some of the more interesting are submitted herewith.

Anodon longinus Spix., 1827.

This species is listed in the Catalogue as an *Anodontites* (Pg. 1446), but the writer agrees with Clessin, Sowerby, Dr. Lea and Von Ihering, that it is really a *Mycetopoda.*

Both Lea and Sowerby place it as a synonym of *Mycetopoda siliquosa* D'Orbigny, but that species is almost square posteriorly, while the present species is roundly pointed.

It agrees much better with that very poorly named species *Mycetopus subsinuatus* Sowerby, 1868, a species quite often devoid of the subsinuate basal margin for which Sowerby named it.

A shell lies before the writer, collected in Guatemala by A. A. Hinkley, which has exactly the shape of Kuster's figure of *longinus*, a species recently identified as the *M. subsinuata* Sowerby, by Ortmann, and I think correctly.

The writer therefore writes the species as follows:

Mycetopoda longina Spix., 1827.

Mycetopus subsinuatus Sowerby, 1868.

Anodonta grijalvae Morelet, 1884.

Simpson placed this species in *Glabaris*, 1900 = *Anodontites*, 1914.

A study of the fine figure given by Crosse and Fischer (1893) seeming to show the usual small, semi-oval, ligamental *sinus*, characteristic of the North American *Anodonta grandis* Say, the type specimen in the British Museum was critically examined for the writer by the late Curator, Mr. Smith, who confirmed this impression.

Specimens of *Anodonta grandis* Say, from southern Texas, having very full, high umbones, and very inequilateral in shape, so closely approximate Morelet's shell that the writer places it as one of the myriad phases of that shell.

Anodonta grandis grijalvae Morelet, 1884.

Anodonta grijalvae Morelet.

Glabaris grijalvae Simpson, 1900.

Leila sowerbyana, new name.

Anodon trautwiniana Sowerby, Fig. 134.

This species is of course nothing like that of Lea's as Sowerby had it. From its nearest of kin, *Anodon rioplatensis* Sowerby, it differs most remarkably in the extremely short anterior margin, as well as in some other less obvious characters.

Leila grayana, new name.

Anodonta exotica (Gray) Sowerby, Fig. 57.

This species differs from *Anodonta moricandi* Lea (with which Simpson doubtfully identifies it) in being considerably larger, with higher umbones, and the posterior point is on a line with the base, instead of about half-way the altitude, etc.

Simpson gives for the genus *Anodontites* a masculine ending, but Ortmann observes that since the type was originally written *Anodontites crispata* by its author, the genus should be regarded as feminine.

FOSSIL SHELLS FROM THE ST. LUCIE CANAL, FLORIDA

BY CHARLES W. JOHNSON

I recently examined a small but interesting collection of shells secured by Mr. Frederick Nelson, an engineer, while at work on the dredge that is digging the St. Lucie Canal to Lake Okeechobee. This canal is to be a deep water canal with locks. About eight miles from the east coast the canal passes through a strip of pine woods and it was while excavating there at a depth of about 40 feet below the surface that the shells were obtained.

There were six specimens referable to *Busycon maximum* var. *tritonis* Conr. of the Duplin beds of North Carolina. The younger specimens were almost typical of that horizon, but in form the older ones resemble small examples of the recent *B. carica* Gmel. They are broad and thick in proportion to their size, but lack the very large spines and enlarged canal of the body whorl, characteristic of the recent var. *eliceans* Montf. of the Indian River, Florida. In all cases the enamel of the aperture was well preserved. The four *Busycon perversum* L. were also peculiar, one young specimen was a typical var. *contrarius* Conr. of the Duplin, while a second was a form common in the Caloosahatchie Pliocene, called *obrapum* by Grabau (Amer. Nat., Aug., 1903), characterized by a small rounded body whorl, with a long straight canal. The others are huge adult shells, with broad low spires, the body whorl slightly encroaching on the preceeding whorl at the suture, the canal short and somewhat curved; as a whole they resemble the recent shells of the eastern coast of Florida. One was perforated by the boring sponge, and the other had the enamel of the aperture well

preserved. Some grayish sand that was obtained from the interior of the latter shell contained the following species:

Crepidula fornicata L (juv.).
Crepidula aculeata Gmel.
Eulima sp? (polished)
Astyris lunata (with color markings).
Oliva mutica Say.
Mangelia cerina K. & S.
Arca transversa Say.
Glycymeris pectinata Gmel.
Pleuromeris tridentata Say.
Chione cancellata L.
Chione pygmaea Lam.
Dosinia discus Rve. (juv.).
Donax variabilis Say (common).
Donax fossor Say ?
Mulinea lateralis Say.
Corbula sp?

The other large shells were two *Fasciolaria gigantea* Kien., about 20 inches in length. One has small nodes on the shoulders of all the whorls, the other has the shoulders and nodes both wanting, except in a few of the early whorls. If recent, the latter would be considered a very large example of the var. *reevei* Jonas. A number of *Oliva sayana* Rav. (*O. litterata* Lam.) were highly polished and some some showed the dark brown letter-like markings, a large *Crepidula fornicata* L., two large thick shells of *Venus campechensis* Gmel. (*V. mortoni* Con.), a large valve of *Glycymeris americana* Defr., and two modern looking oyster shells, constituted the collection.

With the meager data and material at hand, it is difficult to draw any definite conclusions. Mr. Nelson said that shells were first obtained at about 35 feet and as deep as 45 feet. Two beds may therefore be involved. Dr. Wm. H. Dall in his "Tertiary Fauna of Florida" (Trans. Wagner Free Inst. Sci., Vol. 9, pt. 6, p. 1594) says: "The Miocene appears as a soft limestone rock in the vicinity of Jacksonville, and has been traced by material from artesian wells on the east side of the peninsula as far south as Lake Worth." Although many of the recent shells listed are found in the Miocene, *Busycon maximum tritonis* and *B. perversum contrarius*, are the only ones in any way characteristic; the form *obrapum* I have only seen from the Florida Pliocene. The formation deserves a careful study.

THE STATUS OF HELIX OREGONENSIS LEA

BY G. DALLAS HANNA

Lea described *Helix oregonensis* in 1838[1] from an immature specimen collected by Thomas Nuttal near the junction of the Willamette and Columbia Rivers in Oregon. The type is now deposited in the U. S. National Museum but through some curious error it has catalogued with it an adult shell of typical *dupetithouarsii* such as grows only in the vicinity of Monterey Bay, California. How this happened may never be known. Certainly if they were collected together Lea would have described the adult shell. Whether the association of these two specimens influenced Binney or not may likewise never be known; but he placed *oregonensis* as a synonymy of *dupetithouarsii* in his writings and most conchologists have followed him.

Matters stood thus until 1912 when Henry M. Edson[2] revived Lea's name as a substitute for the widely known *Epiphragmophora mormonum* of central California. Some western conchologists have accepted his reasoning at its face value and have proceeded to change the names on their labels as a result. It would seem that Edson's article contains too many assumptions and misstatements to warrant such acceptance without further inquiry. I have attempted such an investigation and have arrived at a very different conclusion.

Edson appears to have relied upon Pfeiffer's original description of *mormonum* and had no authentic material for comparison. He states that the species has been collected at Klamath Falls, Oregon, "which is close to the original locality of *oregonensis.*" The two places are across the state from each other, 250 miles apart. Moreover the Klamath Falls record is based upon reputed material in the "Washington State Museum, fide H[arold] Hannibal." Mr. F. S. Hall, Curator of that Museum has advised me (letter dated March 2, 1922) that there is no such material in the institution from Klamath Falls.

[1] Observations, Vol. II, p. 100, pl. XXVIII, fig. 9, Trans. Am. Phil. Soc., Vol. VI, p. 100, pl. XXIII, fig. 85, 1839.

[2] NAUTILUS, Vol. XXVI, p. 49.

Through the courtesy of Dr. Paul Bartsch I was permitted to make a careful examination of the type specimen *oregonensis* in Washington in January, 1922. It is unquestionably a young shell of the *fidelis* group. This might be suspected since it came from the heart of the *fidelis* country. It seems to belong to the small race afterwards called *minor* by Binney[1] and should replace that name. The small subspecies has been reported from Seattle and other places and the collection of the California Academy of Sciences contains many specimens from Portland, Oregon (near the type locality of *oregonensis*) The Dalles, Oregon and elsewhere in that state.

The name *mormonum* should therefore remain as it was before, applicable to the shells from Mormon Island, Sacramento California. It really represents a group of variants similar to *tudiculata*, *traskii* and *californiensis* groups and typical *mormonum* seems to be restricted solely to the type locality. Fortunately, through the aid of Dr. Emmett Rixford we have considerable collections from there for comparison and others from that general region, but it is not yet time to revise all of the various elements which may be grouped about *mormonum;* some other territory must be visited before the work can be done well. There is a small race of *mormonum* which is similar to the small race of *fidelis* and with a sufficient amount of material from intervening country the two species might be connected with intergrades. This however may be said of *arrosa*, *tudiculata*, *californiensis*, etc.

Lea described *H. nuttalliana* at the same time as *oregonensis;* and it is generally admitted that with the first he was dealing with *fidelis*, the same having been placed in the synonymy of that species for many years. It may seem strange that he did not place his *oregonensis* with his equivalent of *fidelis*. The two however are so different in the extremes that without a large series of specimens intergradation would probably not be suspected. With the same scanty material to-day, any reputable conchologist would probably duplicate Lea's action.

The following summarizes my conclusions:

[1] Man. Am. Land Sh., p. 121, fig. 91, 1885.

Epiphragmophora fidelis (Gray), Proc. Zool. Soc., London, 1834, p. 67. *H. nuttalliana* Lea, Observations, Vol. II, p. 88, 1838. Chiefly found in the Coast Ranges.

Epiphragmophora fidelis oregonensis (Lea), Observations, Vol. II, p. 100, 1838. *A. f. minor* Binney, Man. Am. Ld. Shells, p. 121, fig. 91, 1885. Chiefly found at some distance inland from the coast.

Epiphragmophora mormonum (Pfeiffer), Proc. Zool. Soc., London, 1857, p. 109. So far as known found only at the type locality. Subspecies *hillebrandi* (Newc.) *cala* Pilsbry and *buttoni* Pilsbry have been described.

Epiphragmophora dupetithouarsii (Deshayes), Rev. Zool. 1839, p. 360. Confined to the vicinity of Monterey Bay, California.

APEROSTOMATINAE

BY H. BURRINGTON BAKER

As indicated below, three exceedingly unfortunate changes from the customary usage are necessary.

1. *Aperostoma* becomes the generic title of what is usually known as *Cyrtotoma mexicanum.*

2. *Poteria* (genus and subgenus s. s.) replaces both *Ptychocochlis* and *Plectocyclotus* as the name of the West-Indian group usually regarded as a subgenus of *Neocyclotus.*

3. The closely related mainland species forming the subgenus *Neocyclotus* (*Aperostoma* of authors), also take *Poteria* as their generic title. Gray allowed *Poteria* to remain as a nude name for ten years after its proposal, but finally defined it in the British Museum Catalogue of the Cyclophoridæ (1850). Hermannsen (1852) and Pfeiffer (1852) recognized the name, but it appears to have been entirely omitted from later authors.

List of generic and subgeneric names

Megalomastoma Swainson (1840). Type (designated) *M. brunnea* "Guilding" Swainson (1840), from St. Vincent.

Aperostoma Troschel (1847). Type (Hermannsen, 1852) *Cyclostoma mexicanum* Menke (1830), from Mexico.

Farcimen Troschel (1847). Type (Gray, 1847) *Turbo tortus* Wood (1828), from Cuba.

Poteria Gray (1840–1847, nude; 1850). Type *Turbo jamaicensis* (Chemnitz) Wood (1828), from Jamaica.

Platystoma "Klein" Moerch (1852), not Meigen (1803). First used by Moerch as a synonym of *Cyclotus*.

Cyrtotoma Moerch (1852). Type (monotype) *Cyclostoma mexicanum* Menke.

Crocidopoma Shuttleworth (1857). Type *Cyclostoma floccosum* Shuttleworth (1857), from Haiti.

Buckleyia Higgins (1872). Type (monotype) *Aperostoma montezumi* "Hidalgo" Higgins (1872), from Ecuador.

Tomocyclus Crosse and Fischer (1872). Type *T. gealei* C. and F. (1872), from Mexico.

Amphicyclotus Crosse and Fischer (1879). Type *Cyclostoma boucardi* "Salle" Pfeiffer (1857), from Mexico.

Habropoma Crosse and Fischer (1880). Type *Cyclostoma mexicanum* Menke.

Neocyclotus Crosse and Fischer (1886). Type *Cyclostoma dysoni* Pfr. (1851), from Honduras.

Ptychocochlis Simpson (1894). Type *Turbo jamaicensis* (Chemnitz) Wood.

Plectocyclotus Kobelt and Moellendorff (1897). Type *Turbo jamaicensis* (Chemnitz) Wood.

Ceratodiscus Simpson and Henderson (1901). Type *C. solutus* S. and H. (Naut., 1901). Compare Pilsbry (Naut., 1914).

Neopupina Kobelt (1902). Type *Megalomastoma flavula* Swainson (1840), from Porto Rico.

Key to genera and subdivisions

A. Shell heliciform to planorbiform.

B. Operculum corneous (*Amphicycloteæ*).

C. Shell planorbiform. Ecuador to southern Colombia. Genus *Buckleyia.*

C′. Shell heliciform.

D. Peristome reflected and thickened. Mexico. Genus *Aperostoma* (+*Cyrtotoma* +*Habropoma*).

D'. Peristome simple or thinly reflected. Mexico to Lesser Antilles. Genus, *Amphicyclotus*.

B'. Operculum calcareous (*Neocycloteae*). Tropical America. Genus *Poteria*.

E. Periphery of operculum double because of obliquely raised, spiral, calcareous lamella, which overlaps the outer edge of the basal plate. Cuba, Jamaica, Haiti. Subgenus *Crocidopoma*.

E'. Periphery of operculum simple, or briefly double at the termination of the last whorl; spiral, calcareous lamella almost vertical along inside of whorls. Tropical America.

F. Spiral lamella of operculum prominent; remainder of basal plate with oblique, supporting riblets. Antilles. Subgenus *Poteria* s. s. (+*Ptychocochlis* +*Plectocyclotus*).

F'. Whorls of operculum simply thickened at their inner edges; oblique riblets scarcely visible. Typically mainland. Subgenus *Neocyclotus*.

B''. Operculum unknown; shell discoid and minute (max. diam. 5 mm.). Cuba and Haiti. Genus *Ceratodiscus*.

A.' Shell pupiform to turrite; apex usually deciduous; operculum corneous. (*Megalomastomeae.*)

B. Shell rimate to perforate; either pupiform or with peristome but slightly reflected. Antilles, Ecuador (??). Genus *Megalomastoma*.

C. Shell pupiform; peristome reflected and thickened. Cuba and Haiti. Section *Farcimen*.

C'. Shell elongate; peristome simple. Porto Rico. Section *Neopupina*.

C''. Shell elongate; peristome thin, slightly reflected and often double. Porto Rico and Lesser Antilles. Section *Megalomastoma* s. s.

B'. Shell perforate, turritiform, and with broadly reflected peristome. Southern Mexico and Guatemala. Genus *Tomocyclus*.

THE IDENTITY OF HELIX DEPRESSIFORMIS AND H. PROSTRATA PEASE

BY HENRY A. PILSBRY AND C. MONTAGUE COOKE

Two of Pease's Helices described[1] from the "Central Pacific" have baffled all attempts at identification by other naturalists. The present writers, separately and together, had time and again gone over the descriptions, finally giving them up, as the types could not then be found in the Pease collection. One of us (C. M. C.) recently worked over Pease's shells at Cambridge, finding the original specimens of both *H. depressiformis* and *H. prostrata*, which had been misplaced in the collection. These have now been examined by both of us.

The specimens of *H. depressiformis* were contained in a vial also containing examples of *Pterodiscus alatus* (Pfr.). Labels of both species in Pease's handwriting were present. Pease's species proves to be a very young shell of *Trochomorpha swainsoni* (Pfr.), a Raiatean (Society Island) species. We find that the unique type of *Planamastra peaseana* Pils. (Man. Conch., XXI, 130) is a still younger example of the same species. Its locality "Hawaiian Islands" (from Pease) was clearly erroneous.

Helix prostrata Pease turns out to be *Planorbis opercularis* Gld., a common West American shell. We were able to examine the dentition, as the animal was dried in one of Pease's specimens. Pease's description is fairly good, but it is hardly surprising that the species was not recognized before; the generic reference and locality effectually disguised it.

COLLECTING ON AN ABALONE

BY F. W. KELSEY

Some of my young friends who collect shells at the seashore may be interested in the following method of getting specimens for a collection, when better means are not at hand.

[1] Proc. Zool. Soc., London, 1864, p. 670. They were placed with doubt in the genus *Planamastra* in Manual of Conchology, XXI, pp. 131, 132.

On May fourteenth of this year I took a boat trip to the Coronado Islands, in Mexican waters, about twenty miles southwest of San Diego. Arriving at the anchorage at high tide, shore collecting was out of the question, so I went out with the skipper and mate in a glass-bottomed boat to a portion of the cove known as the "Marine Gardens". The water is very clear and at points where it is from two to three fathoms deep the view of the waving kelp, sea moss, grasses, shells and many colored fish is exceedingly interesting.

With a long-handled trident, or spear, the skipper would occasionally dislodge an abalone from the rocks, turn it over on its back and with a prong of the spear pierce the flesh of the mollusk and bring it up to the boat. About a dozen fine specimens were thus obtained, one being *Haliotis corrugata* Gray and all the remainder *Haliotis fulgens* Phil. The backs of several shells were covered with moss and other growths which I removed with my pocket knife from the backs of seven shells to be brought home for examination. The scrapings were treated to an all-night bath in a three-percent solution of formaldehyde, then rinsed and thoroughly dried, when they were shaken out and carefully examined for shells. From the material scraped from the seven shells I picked ninety-four specimens, including the twenty-five species which follow.

Amphissa versicolor Dall.
Assiminea californica Cooper.
Cerithiopsis columna Cpr.
Lasea rubra Mont.
Lacuna unifasciata Cpr.
Lacuna solidula Loven.
Mangilia striosa C. B. Ads.
Littorina planaxis Nutt. (juv.).
Odostomia americana D. & B.
Odostomia tenuisculpta Cpr.
Phasianella compta pulloides Cpr.
Fissurella volcano crucifera Dall.
Pecten, sp. (juv.).
Crepidula dorsata Brod.
Columbella aurantiaca Dall.
Columbella gausapata Gld.
Eulithidium substriatum Cpr.
Acmaea paleacea Gld.
Acmaea rosacea Cpr.
Acmaea asmi Midd.
Saxicava rugosa Linn.
Philobrya setosa Cpr.
Marginella regularis Cpr.
Psephis tantilla Gld. (1 valve).
Cardita subquadrata Cpr.

NEW SPECIES AND VARIETIES OF MOLLUSCA FROM LAKE WINNEBAGO, WISCONSIN, WITH NEW RECORDS FROM THIS STATE

BY FRANK C. BAKER

(Concluded from p. 133)

The lake forms of *gibbosus* are all referable to Grier's *sterkii*, which is the lake manifestation of this species, though they are smaller than the Lake Erie specimens listed. The Winnebago shells are like Ortmann's figures (1920, pl. 8, fig. 3). Measurements of the Winnebago form are given below:

Length 61, height 33, width 19 mm., per cent 31.
Length 63, height 32, width 20 mm., per cent 31.
Length 64, height 34, width 20 mm., per cent 31.

Fusconaia rubiginosa parvula Grier. Winnebago Lake, gravel and boulder bottom, one to ten feet in depth. The Lake Winnebago shells seem referable to the Lake Erie form distinguished by Grier. Measurements of the Wisconsin shells are given below:

Length 56, height 44, width 32 mm.
Length 55, height 40, width 25 mm.
Length 34, height 33, width 24 mm.
Length 38, height 32, width 19 mm.

Parvula is an offshoot of *rubiginosa* rather than of *trigona*, if the Lake Winnebago specimens are referable to the Lake Erie variety. *Rubiginosa* is common in the Fox River and it is from this stock that the lake shells have sprung. The *parvula* here considered are wider than the river form, more trigonal and strikingly swollen anteriorly. A single specimen from Lake Winnebago (number 3 in the measurements above) is markedly trigonal and approaches *trigona* in general shape. The epidermis is yellowish-brown, becoming darker in old specimens.

Amnicola judayi n. sp.

Shell ovate conic, rather wide, widely umbilicated, with rather more than 5 very convex whorls separated by deeply impressed sutures; whitish or corneous, sometimes light brown, shining, lightly striate longitudinally; apex acute; aperture

roundly ovate, a trifle oblique; peristome continuous, somewhat flattened where it is in contact with the preceding whorl.

Length 5.0, width 3.3; length of aperture 2.0, width 1.5 mm. Holotype.

Length 4.4, width 3.1; length of aperture 2.0, width 1.6 mm. Paratype.

Off Doemel Point, Lake Winnebago, on a sandy mud bottom, in nine feet of water.

Associated with *Amnicola limosa porata* is a large form of Amnicola which cannot be referred to any described species. It resembles *cincinnatiensis* in general form, but is smaller with more rounded whorls and a wider umbilicus. It is larger than *winkleyi* Pilsbry (NAUT., Vol. 26, p. 1), with wider whorls and more upen umbilicus. It resembles Tryon's figure of *schrökingeri* Ffld. (Con. Hald. Mon., pl. 17, fig. 1), but is very much larger than that species. It belongs to the group with projecting first whorl and not to the limosa group which is flat on the apex. *Judayi* is one of the most graceful of the Amnicolas, and I take great pleasure in dedicating it to Dr. Chancey Juday, of the University of Wisconsin.

Lioplax subcarinata (Say). Lakes Winnebago and Butte des Morts, sand and mud bottoms, in water one to 13 feet in depth; Omro, Fox River, mud bottom, water 2–3 feet deep. There appear to be several forms of Lioplax included under the name *subcarinata.* The Winnebago Lake shells have subcarinate whorls, which in a large majority of specimens are rounded without a sign of a ridge or carina. Say especially mentions the apex which he describes as "truncated and re-entering". is a peculiar feature which seems to be characteristic of all the material examined from Wisconsin. This is a physiologic character, the truncation and subsequent replacing of the spire with a rounded plug taking place after the shell has acquired five full whorls. All of the young have perfect spires with regularly coiled, rounded whorls. Young shells 8½ mm. long have five whorls, mature shells 16 mm. long have but 4½ whorls; the adult shells, if unmodified, would have 6–7 whorls. Binney's figure 118 fairly well represents the true *subcarinata.* The Winnebago shells measure as follows:

Length 18, width 11.5; aperture length 8, width 6 mm.

Length 14, width 10.1; aperture length 7, width 5 mm.

Subcarinata lives in shallow water in the river and deep water in the lakes. Probably the deeper water of the lake provides the same cool temperature and oxygen supply as the shallow parts of the flowing river.

Planorbis umbilicatellus Ckll. This little-understood species occurred in several places near Lake Winnebago, always in swales or quiet pools. These specimens are somewhat larger than specimens from Colorado and the west. A few individuals have fine, regularly disposed ribs on the base of the shell, where the growth lines are somewhat raised.

Polygyra multilineata algonquinensis Nason. The shells from the Winnebago region are all smaller than typical *multilineata* and the spire is more elevated. These seem nearer Nason's variety *algonquinensis* than any other form (see NAUTILUS, Vol. 19, p. 141). Three specimens measured as follows:

Greatest diameter 21.5; height 15 mm.

Greatest diameter 22.0; height 15.5 mm.

Greatest diameter 18.5; height 13.0 mm.

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NEW LYMNAEAS FROM WISCONSIN AND MINNESOTA WITH NOTES ON SHELLS FROM THE LATTER STATE*

BY FRANK C. BAKER

LYMNAEA (GALBA) WINNEBAGOENSIS n. sp.

Shell elongated; rather thick and solid; periostracum very light horn color; surface dull, lines of growth crowded, coarse, crossed by more or less deeply incised spiral lines; nuclear whorls 1¼, small, well rounded, dark wine or light horn colored; whorls 7, flatly rounded, the body whorl more convex; spire long, forming a very regular sharp-pointed cone, longer than the aperture; sutures impressed; aperture ovate; peristome slightly thickened within by an inconspicuous varix edged with purple; inner lip rather wide, reflected and appressed tightly to the columellar region, leaving a very narrow umbilical chink, and forming a wide callous deposit on the parietal wall; columella with a heavy, oblique plait, twisting the axis.

Length 26, width 12.2; aperture length 12, width 6 mm. Type.

Length 22.5, width 10.4; aperture length 10, width 5 mm. Paratype.

Length 19, width 10; aperture length 10, width 5 mm. Paratype.

Length 18, width 9.1; aperture length 9.1, width 4.2 mm. Paratype.

Length 15.5, width 7.1; aperture length 7.2, width 3.5 mm. Paratype.

Length 6.9, width 3.2; aperture length 4, width 1.6 mm. Paratype.

Types No. z11826, Museum of Natural History, University of Illinois.

Type locality. Oshkosh, Lake Winnebago, Wisconsin.

Habitat. When young and immature on vegetation in protected places, like coves and bays. When adult in deeper water on gravel and sand bottom.

* Contribution from the Museum of Natural History, University of Illinois, No. 18.

This characteristic species evidently belongs to the *catascopium* group of Lymnaeas, having the same texture of shell as the lake forms of that species and occupying the same kind of habitat. It differs from all varieties of *catascopium* in its long, pointed spire, small aperture, and flat-sided whorls. It somewhat resembles some large individuals of *Lymnaea catascopium adamsi* Baker from the St. Clair flats near Detroit, Mich., but is much larger and has a differently shaped spire and aperture (see Mon. Lym., p. 393, pl. 42, figs. 5–8). It somewhat resembles *Lymnaea nashotahensis* Baker, a Pleistocene fossil found in Wisconsin, but the whorls of that species are more rounded with deeper sutures. *Lymnaea danielsi* Baker also approaches this species in general form, but the whorls are rounder, the aperture more elongate with a heavier plait on the columella. The aperture is also peculiarly effuse, a character not shared by *winnebagoensis*.

Winnebagoensis is an abundant mollusk in all parts of Lake Winnebago, the shore debris often being made up largely of this species. A more detailed paper on the ecology of this and other species found in this lake is being prepared.

LYMNAEA (GALBA) MINNETONKENSIS n. sp.

Shell elongated, fusiform, rather thin; periostracum light horn color; surface dull to shining, sometimes spermaceti-like, lines of growth crowded and crossed by deeply incised spiral lines; nuclear whorls 1½, small, well rounded, light horn or dark wine colored; whorls 6–7, flatly convex, the body whorl often much flattened; spire long, pointed, forming a rather wide cone about as long as the aperture; sutures well impressed; peristome thickened within by a heavy varix edged with dark red or purple; inner lip rather wide, reflexed and tightly appressed to the columellar region leaving a small umbilical chink; a wide callous deposit is formed on the parietal wall; columella with a heavy oblique, twisted plait.

Length 27, width 13; aperture length 14, width 7 mm. Type.
Length 31, width 15.6; aperture length 16.7, width 8 mm.
Length 27, width 14.5; aperture length 14.5, width 7 mm.
Length 22.5, width 12.4; aperture length 12, width 6.1 mm.

Length 26.5, width 13; aperture length 13.7, width 7 mm.
Length 22, width 12; aperture length 12, width 6 mm.
Length 22.6, width 13; aperture length 12.5, width 5.6 mm.
Length 24, width 12; aperture length 13, width 6 mm.

Types No. z11827, Museum of Natural History, University of Illinois.

Type locality. Assembly grounds, Lake Minnetonka, Minnesota.

Minnetonkensis is also a species of the *catascopium* group of Lymnaeas, in which the spire is lengthened and more acute and the body whorl is more elongated and compressed than in the typical *catascopium* as found in Michigan and New York. It is also much larger than *catascopium*. It resembles two species of Lymnaeas which occur in lakes; *danielsi* Baker, which has a longer spire with rounded whorls and a peculiarly effuse aperture with a marked columellar plait; and *winnebagoensis* (herein described) which has a longer spire, flatly and sharply conical, with flat-sided whorls, a narrower shell and a shorter, wider aperture (compare the measurements on previous page). *Winnebagoensis* also has a thicker shell. The Minnesota shell occurs in countless numbers in Lake Minnetonka, the shore debris being composed largely of this species. No living specimens were found, the time spent at the lake being limited.

The three species of Lymnaeas mentioned and described herein are evidently related and are probably expressions of a response to habitat conditions, hence ecological species. The lakes of the northern part of the United States and Canada abound in such ecological species, to which region most of these variations are confined.

Several days were spent in southeastern Minnesota during the latter part of June, 1920. Lake Minnetonka and the vicinity of St. Paul were the principal localities visited. The following were collected.

Beach debris, south side of lake near assembly grounds, Lake Minnetonka, Hennepin County.

Anodonta grandis footiana Lea.
Lampsilis luteola rosacea (De Kay).
Planorbis deflectus Say.
Planorbis exacuus Say.
Planarbis parvus Say.

Sphaerium sulcatum (Lamarck).
Lymnaea stagnalis appressa Say
Lymnaea (Galba) minnetonkensis Baker.
Lymnaea (Galba) obrussa decampi Streng.
Planorbis trivolvis Say.
Planorbis campanulatus Say.
Planorbis antrosus Conrad.
Planorbis a. unicarinatus Hald.
Physa sayii Tappan.
Physa niagarensis Lea.
Vulvata tricarinata (Say).
Amnicola limosa porata Say.
Amnicola lustrica Pilsbry.
Succinea retusa Lea.
Succinea avara Say.
Vitrea hammonis (Ström.).

Banks of Mississippi River, St. Paul, Hennepin Co.

Polygyra profunda Say.

Polygyra profunda pleistocenica Baker. A specimen comparing in size and shape with the form named *pleistocenica* (see NAUTILUS, XXXIV, p. 66) occurred with normal *profunda*. It was marked by one wide band of color above the periphery.

Zonitoides arborea (Say).
Vitrea hammonis (Ström.).
Pyramidula alternata (Say).
Helicodiscus parallelus (Say).
Strobilops virgo (Pilsbry).

Small stream flowing through ravine on bank of Mississippi River, St. Paul.

Aplexa hypnorum (Linn.).
Physa walkeri Crandall.
Lymnaea (Galba) caperata Say.
Succinea ovalis Say.

A LARGE QUADRULA HEROS SAY

BY WILLIAM B. MARSHALL

Assistant Curator Division of Mollusks, United States National Museum

The collection of the United States National Museum contains the left valve of an unusually large and internally fine specimen of *Quadrula (Crenodonta) heros* Say. Mr. Ernest Danglade of Vevey, Indiana, formerly of the United States Bureau of Fisheries obtained the specimen from a pearl fisherman who had crushed the other valve. In transmitting the shell to the Museum Mr. Danglade sent the following note: "The shell was

found in Eagle Creek, near Eagle Station, Kentucky, on October 10, 1917. This stream flows through a fertile soil on a limestone formation and of course the water is naturally hard. This condition, in connection with an abundance of food, no doubt accounts for the unusual size and thickness of the shell, as well as the quality of the material." The locality is in Carroll County, Eagle Creek flowing into the Kentucky River a few miles above the junction of the latter with the Ohio River.

This is the largest shell of its kind ever seen by Mr. Danglade, who, as an attache of the Bureau of Fisheries, has observed and handled thousands of shells of this species. It is much larger than any other specimen in the National Museum.

The following data relating to size should be of interest:

Length 216 mm (about 8½ inches).

Height 150 mm. (about 6 inches).

Diameter (if both valves were present would be) 70 mm., about 2⅘ inches.

Perimeter 600 mm. (nearly 2 feet).

"Circumference", (i. e., around the shell crosswise to the length) would be 14½ inches. This is two inches larger than the specimen whose measurements were given by W. S. Strode in the Nautilus, IX, p. 116.

Weight of this valve about 723 grams (1 pound, 9½ ounces).

Weight of whole shell must have been about 1446 grams (3 pounds, 3 ounces).

Capacity of this valve, 295 c. c., about 18 cubic inches.

Capacity of whole shell about 590 c. c., about 36 cubic inches.

Amount of material in this valve 263 c. c., about 16 cubic inches.

Amount of material in whole shell about 526 c. c., about 32 cubic inches.

When gorged with water the specific gravity of the animal must have approximated that of water itself, so that it is reasonable to believe that the contents of the shell when living weighed about 590 grams (about 1 pound, 5 ounces) and that the shell, the animal and the water enclosed in the shell had a combined weight when collected of about 2036 grams (nearly 4 pounds, 8 ounces).

The beak is somewhat eroded but the rest of the exterior of the shell is in good condition and most of the periostracum is well preserved. Internally the shell is rather fine, the nacre being silvery and iridescent. The cardinal and lateral teeth as might be expected are massive, the muscular scars and pallial line are deeply impressed.

Doubtless the shell was at about the limit of size attainable to this species but there is nothing about the shell itself (other than its great size) to indicate that there will be no further growth. Apparently the shell-secreting organs of the animal were in full vigor and in readiness to perform their function should further growth of the animal require enlarged accomodations. It seems probable, too, that the secretion of calcareous matter was still going on and that if the animal had been permitted to live there would have been a further thickening.

The specimen is Cat. No. 346631, U. S. N. M.

NOTE ON FENELLA A. ADAMS

BY WM. H. DALL

Fenella (originally spelled *Finella* by a typographical error) was described by Adams in 1860 and has suffered many vicissitudes. The species have been referred to the Rissoidae, Pyramidellidae, Cerithiidae, and Litiopidae. Carpenter made the error of identifying West American species with *Mesalia*, *Styliferina*, and *Alvania*, and a species of *Halistylus* with *Fenella*, which, as well as Adams' typical species, is figured by Tryon in his Manual.

The fortunate discovery in the collection of the National Museum of specimens of Adams' typical species received directly from him many years ago, has enabled me to positively identify *Fenella* with *Alabina* described by me in 1902. It has a normal protoconch of about three smooth brown turbinate whorls which definitely removes it from the Pyramidellidae. The data given by Fischer about the animal might apply to a *Bittium* or a Rissoid, but from an examination of dried specimens I have

been able to determine that the operculum is multispiral and circular, which definitely removes it from the Rissoidae. Dried Japanese and Hawaiian specimens were tested for the radula without success but finally a specimen of *Alabina diomedae* Bartsch from California yielded the desired item, which proved to resemble the radular structure of *Lampania*, as figured by Troschel in Das Gebiss der Schnecken. This definitely settles the Cerithioid relations of the genus, which may find a place near *Bittium* in the general system, as I placed it in my summary of the Marine Mollusks of the Northwest Coast of America.

AN ABNORMAL SHELL OF MYA ARENARIA

BY EDWARD S. MORSE

The many deformations in the shells of Mollusca have often been described and figured and their causes easily explained. Some of these deformations have been due to injuries to the shell in its early stages, others are due to an arrest of development—atrophy, or an access of growth—hypertrophy, as are the usual causes of malformations among the higher animals and man. In shells these malformations generally consist in the case of gasteropods of the whorls being separated, elongation of the spire, extra knobs, spines, ribs or keels or simple monstrosities; reversed twirls of the spire in dextral shells, supernumerary teeth in the aperture. These and other modifications of the shell are readily understood. I now present an example of an abnormal growth which has so far been inexplicable to me, and it is hoped that some reader of the NAUTILUS will solve the problem. Recently I received the right valve of the common clam, *Mya arenaria*, from my friend Major John M. Gould, who received it from Levi C. Carter of Loudville, Maine, who got it at Marsh Island, midway between the Kennebec and Penobscot Rivers.

On the anterior portion of the shell a conspicuous raised flattened rib appears which starts near the beak and continually widens with the growth of the shell, and at the margin projects

a considerable distance beyond as shown in the figures. An examination of the shell under a lens reveals that by some accident at a very early stage the margin of the shell was broken and there began to form a shallow raised ridge very narrow at first but continually widening as the shell increased in size until at the margin of the shell it was not only 20 mm. in width, but projected 7 mm. beyond the margin of the shell. This flattened rib radiated from the umbone as any rib would radiate in a lamellibranchiate shell. The extraordinary character of this rib is that it is hollow, the interior is open throughout, as the wire *A–B* in the figure shows, the posterior half is interrupted by columns of nacreous material which run from the shell to the upper portion of the tube, indeed there seems to be a partition separating the tube into halves. The upper part of the ridge is broken away for a distance of 25 mm. from the umbone, en-

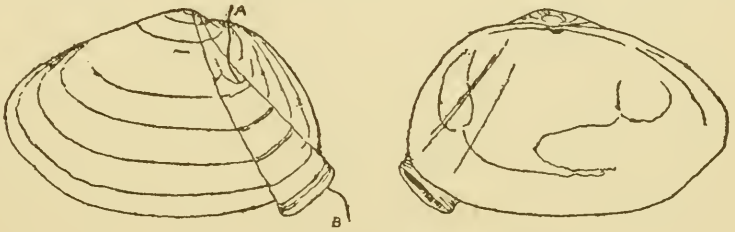

Fig. 1. Abnormal *Mya arenaria.*

abling one to examine the floor of the ridge, and this shows a distinct depression in the shell; on the inside of the shell there is a marked swelling or thickening of the nacre to the extreme border. The upper wall of this ridge projects 5 mm. below the lower wall, which in itself projects 3 mm. below the margin of the shell, thus one is enabled to examine the inner wall of the tube and it is nacreous. Dried animal matter was picked out of the tube. To build this tube a membrane must have had a mantle margin which would secrete layer after layer of shell as the strong lines of growth indicate, as well as epidermis, and the surface of the membrane must have poured out its nacreous layer as the tube is so lined, yet the normal growth of the shell is not interrupted in any way. In some manner a portion of the mantle must have been displaced at the time of the injury to the young shell, if turned back it must have again become reflexed

to bring the edge of the mantle free again. It is unfortunate that the specimen was not preserved alive. The other valve of the shell was perfectly normal.

I cannot recall among the lamellibranch or gasteropod shells, either normal or abnormal, a tubular process, indeed the nearest approach is seen in the little tubular processes on the periphery of Aspergillum.

JEANETTE M. COOKE

Miss Jeannette M. Cooke died at her home on Point Loma in the city of San Diego, California, on October 21st, 1920. She was widely known among conchologists on account of the valuable material which she had accumulated from Lower California, which has gone into many of the great museums of the world and into a very large number of private collections.

She was born at Westford, Vermont, on March 10th, 1843, but went to Elyria, Ohio, when about nine years old. She came to San Diego in 1882 and opened "The World Curio Store" in 1886. This she maintained until about 1908 when she retired from business and moved to Point Loma.

Early in the history of the store she sent out a boat in charge of Captain George D. Porter and John Johnson for the purpose of collecting all sorts of marine life on the coast of Lower California. She made several changes in her boats and, about 1895, she purchased a small Chinese junk which had been built in San Diego, and which they rechristened "The World". In this boat these two men went for a more extended cruise into the Gulf of California.

Tiburon Island, the largest island in the Gulf of California, is inhabited by the notorious Seri Indians, who are the Ishmaelites of that region, their hands having been against all of their neighbors from their earliest recorded history. Miss Cooke told the writer that Capt. Porter had promised her that under no circumstances would they land on Tiburon Island. Nevertheless, about the end of October, 1896, they did land on this large island, were ambushed and killed by the Seris, and their boat

was looted and burned. An investigation made by the Mexican Government at the request of our State Department elicited the fact that they had landed from a small boat and gone along the beach to collect. A band of Indians ambushed them upon their return, killing Johnson at the first fire, but Porter managed to reach the small boat on the beach and killed five of the Indians before they killed him.

After this Miss Cooke made no attempt to organize further collecting along the Lower California Coast, contenting herself with the purchase of stock and the turning over of the large accumulations of former years. She early became interested in the conchological side of her work and started many years ago to make a private collection which had reached rather large dimensions at the time of her death. She furnished the types of a large number of new species and varieties, most or all of which were described by the late Dr. R. E. C. Stearns, Dr. W. H. Dall and Dr. Paul Bartsch. Probably the most remarkable one of these was taken on Guadelupe Island off the Lower California Coast and was described by Dr. Stearns as *Uvanilla regina*. This shell seems to be a perfect *Uvanilla*, but specimens taken long after the description was written showed the operculum to be Trochoid.

In accordance with Miss Cooke's expressed desire, her private collection has become the property of the Theosophical Society and Universal Brotherhood, of which she was a member, and is held at their International Headquarters on Point Loma.

FRED BAKER.

POINT LOMA, CAL., MAY 25, 1922.

NOTES.

TYPES OF FÉRUSSAC'S SUBGENERA OF HELIX. A few of the subgenera of Férussac's Tableau Systematique seem to be still without definitely designated types, or at least I have not found them. Types are here selected.

Cochlodina Fér., p. 61. Type *Clausilia bidens* Draparnaud.

Cochlohydra Fér., p. 26. Type *Helix putris* L.

Cochlogena Fér., p. 53. Type *Bulimus guadalupensis* Brug.

These designations have no effect upon current nomenclature of the groups concerned. The type of *Helicogena* Fér. is somewhat doubtful. Gray (P. Z. S., 1847, p. 171) mentions *Helix acutangula*, but that species is not in Férussac's list. On p. 173 he mentions *H. candidissima*, which is one of Férussac's species. The name *Helicogena* has generally been used for the *Helix pomatia* series, but I have not seen any early designation of one of that group as its type.—H. A. Pilsbry.

Gemma gemma purpurea (Lea) was recently found by Mr. Frank J. Keeley in vast numbers in Indian River, near Hawks Park, Florida. They occurred in a patch of about a foot diameter, the layer of living shells about 2 inches deep. It was on a mud bar about a foot above low water. Handfulls of pure shells could be scooped up.—H. A. P.

Note on Leptinaria imperforata Fred Baker. In my report on the Land and Fresh-Water Mollusks of the Stanford Expedition to Brazil, published in the Proceedings of the Academy of Natural Sciences of Philadelphia for December, 1911, I described, at page 646, and figured, a new species as *Leptinaria imperforata*. I have just discovered that this name was used by Strebel in 1882, as reported fully in the Manual of Conchology, Second Series, Vol. 18, p. 317, pl. 42, fig. 28, so that my name becomes a synonym. I suggest that my species shall be known as *Leptinaria charlottei*.—Fred Baker.

Localities of Northern Californian Land Snails: a correction. There is a regrettable error in my paper on "Some Land Snails of Shasta County, California," appearing in the Nautilus for October, 1921, which should be corrected before it is perpetuated. Not having access at the time the paper was written to a sufficiently detailed map of California, and being ignorant of the point myself, I perforce followed the field label which accompanied the specimens reported upon. This read "Two miles north of Weed, Shasta County, California." Access to a better map, which I did not gain until too late to

change the statement on the printed page, has since shown that Weed is really in Siskiyou County. To avoid being misleading the title of my paper should therefore have read, "Some Land Snails of Siskiyou and Shasta Counties, California."

It may be added that the date "1192" on p. 38 of the same paper should read "1920", as correctly appears elsewhere.—A. Stillman Berry.

Mollusks Dredged from San Diego Bay. Near the foot of State Street, San Diego, California, a long strip of ground formerly covered at high tide, has been filled in by dredgings from the adjoining portion of San Diego Bay. A large portion of these dredgings consist of pure sand, but many tons of shells have also been taken from the bay and used in this new-made ground. In spots probably more than 10,000 cubic feet of broken shells have thus been deposited, and a few notes on these dredgings may be of interest.

Chione contributes the greatest bulk to these shell masses; in my boyhood days *C. fluctifraga* was the most abundant clam collected for food from San Diego Bay. *C. undatella* and *C. succinata* being comparatively rare in the gatherings for food; *C. fluctifraga* is vastly in the minority, however, in these dredgings, *C. succinata* being easily the most abundant content. *Tagelus californianus* is a very prominent constituent in some of these beds, but in many places I find *Crucibulum spinosum* leading easily numerically. Among the Macomas, *M. nasuta* is the most abundant; *Semele pulchra* is not rare though not conspicuous; *Donax* is nearly absent—only a few valves of our two common species being observed in the acre or more of ground inspected.

In my boyhood *Cardium elatum* was not rare in our bay, but I have not heard of a living specimen having been found here in the last thirty years; a few fragments were found in these shell heaps, while *C. substriatum* was abundant, and a few fragments of *C. quadragenarium* were observed; *C. procerum* seemed to be absent, indicating that the dredge had not touched any of the pleistocene deposits surrounding portions of our bay—the shell sands containing nothing that could be ascribed to a past age.

Moerella meropsis and *Angulus carpenteri*, and a few valves of *Cooperella subdiaphana*, *Metis alta* (few), *Pecten acquisulcatus*, *P. monotimeris*, fragments of *Modiolus capax*, many valves of *Ostrea lurida*, a single valve of *Leda*, another of a *Nucula*, and many valves of a *Glycymeris*, *Lucinisca nuttallii*, *Heterodonax bimaculatus*, *Solen rosaceus*, *Cryptomya californica* and a few fragments of *Mactridae*, and numerous valves of *Corbula luteola*, conclude the census of the bivalves.

Dentalium neohexagonum in abundance, and occasionally one of another species, with numerous specimens of *Cadulus nesiotes*, *Bullaria gouldiana*, *Rictaxis punctocaelata*, and thousands of *Acteocinas* were observed. *Cerithidea californica*, and occasionally specimens of *Melampus olivaceus*, one large *Olivella biplicata* and hundreds of *O. boetica* and other forms doubtfully referred to *O. pedroana* and *O. porteri*, were found. One *Marginella jewettii*, many of *M. subtrigona* and *M. regularis*, one *Hyalina californica*, and several *Merovia pyriformis*, were among the small species. *Acmaea depicta* and *A. paleacea* were not rare, but only one *A. insessa* was found. *Alectrion fossata*, *mendica*, *cooperi*, *perpinguis*, and what we used to call *tegula*, were noted, and *Anachis* and *Alia* were plentiful in spots. One *Murex festiva* and one *Tritonalia poulsonii* were the sole representatives of these genera. Fifty or so specimens of *Epitomium* and one or two *Melanella* rewarded my search. *Turbonilla* and *Odostomia*, *Cerithiopsis* and *Bittium*, *Crepidula rugosa*, *Phasianella compta*, one *Polinices reclusiana*, and a few *Omphalius ligulatus*, a very few *Litorina scutulata*, nearly complete the list of species, except for three or four forms formerly termed *Caecum*, not yet specifically determined.—C. R. Orcutt.

PUBLICATIONS RECEIVED.

Proceedings of the Malacological Society of London, Apr., 1922, Vol. 15, pt. 1:—

On the Pseudo-genus Pseudomarginella v. Maltzan. By the Rev. Dr. A. H. Cooke, pp. 3–5.

The Radula of the Volutidae. By the Rev. Dr. A. H. Cooke. pp. 6–12.

Note on Reproduction of Turritella. By Lieut.-Col. A. J. Peile, p. 13.

Some Notes on Radulae. By Lieut.-Col. A. J. Peile, pp. 13–18.

A List of the species and genera of Recent Mollusca first described in "Le Natualiste." By Hugh C. Fulton, pp. 19–31.

Note on the British species of Anomia. By R. Winckworth, pp. 32–34, pl. 1.

Note on a Holocene Deposit at Penton Hook. By J. E. Cooper, pp. 35–36.

Note on the genera Neptunea and Syncera. By W. H. Dall, p. 36.

A Reply on the genera Neptunea and Syncera. By T. Iredale, p. 37.

The nomination of "Recent" fossil mollusca. By T. Iredale, pp. 37–38.

The status of Helicella and Polita. By Dr. H. A. Pilsbry, pp. 38–40.

On the connection between style-sac and intestine in Gastropoda and Lamellibranchiata. By Guy C. Robson, pp. 41–46.

On the genesis of the designation of "types" among Malacological writers. By A. S. Kennard and B. B. Woodward, pp. 47–51.

On the Pisidium gassiesianum of Dupuy. By A. W. Stelfox, pp. 52–53.

Report on the Gassies collection of Pisidia in the Musee d'histoire Naturelle de Bordeaux. By A. W. Stelfox, pp. 54–57.

New Pearly Fresh-water Mussels from South America. By Wm. B. Marshall (Proc. U. S. Nat. Mus., Vol. 61, pp. 1–9, pls. 1–3, 1922). Eight new species and one new genus—*Diplodontites* are described and figured.

The Miocene of Northern Costa Rica. By A. A. Olsson (Bull. Amer. Pal., Vol. 9, pt. 1, pp. 1–168, pls. 1–15, 1922). The material on which this monograph is based represents over two years of field work by the author in Panama and Costa Rica. There is a chapter on the stratigraphy of the region,

with a general correlation with other beds. Over 100 new species and varieties of Gastropods are described. The dearth of family names makes the grouping of genera somewhat confusing. The genus *Halia* is now placed in the Volutidae.—C. W. J.

Revision of W. M. Gabb's Tertiary Mollusca of Santo Domingo. By H. A. Pilsbry (Proc. Acad. Nat. Sci. Phila., 1921, pt. 2, pp. 305–435, pls. 16–47 and 48 figs. in text). This work reviews the more recent papers, and forms a complete résumé of the subject. Numerous new species and subspecies are described. The illustrations are unusually fine and the artist, Miss Helen Winchester, deserves great credit in showing so clearly the beautiful sculpturing of the shells.—C. W. J.

The Mollusca collected by the University of Michigan-Walker Expedition in southern Vera Cruz, Mexico. By H. Burrington Baker. Occas. Pap. Mus. Zool. U. of M., No. 106, 1922. Though handicapped by high water, about a dozen species and subspecies were taken in the San Juan River system. The value of the groups *Leptonaias*, *Sphenonaias*, *Actinonaias* and their synonyms is considered at some length, and the following are described as new: *Elliptio* (*Sphenonaias*) *liebmanni cuatotolapamensis*, *Actinonaias* (*Disconaias*) *walkeri*, *Lampsilis rovirosai sanjuanensis* and *Lampsilis ruthveni*. He considers *Lampsilis fimbriata* Frierson a small-river form of *Actinonaias discus* (Lea).[1]

Ampullaria patula catemascensis is a new subspecies which appears to be quite distinct—an unusual condition among Mexican Ampullariidæ.

Among the land shells, the synonymy of some perplexing Helicinidæ is considered, and there is a discussion of the *Guppya-Euconulus* group, with figures of the dentition. *Thysanophora pilsbryi* n. sp. is described, and a key to species of the region is given. *Miraverellia* is a new subgenus for *Averellia sumichrasti* (C. & F.).

The Unionidæ are fully illustrated in series showing variation, changes with age, etc. It is by such careful studies as this that we may hope to get somewhere near an understanding of these perplexing Mexican Unionidæ and their tangled nomenclature. —H. A. P.

[1] By an error of some sort, this name is spelled *disca* on p. 22.

THE NAUTILUS.

Vol. XXXV OCTOBER, 1922. No. 2

LAND SHELLS OF VANCOUVER ISLAND.

BY H. A. PILSBRY AND C. MONTAGUE COOKE.

During part of July and August one of us (C. M. C.) spent some time at Vancouver Island. Land shells were nowhere found in abundance, and in many places they seemed entirely wanting. Yet not much time was given to the search.

Vancouver Island, about four miles south of Union, in pine forest along road, above a deposit of fossil sea shells. On the ground and under bark. 24 & 25/vii/18.

Epiphragmophora fidelis (Gray).
Polygyra columbiana (Lea).
Polygyra germana vancouverinsulæ P. & C.
Haplotrema vancouverensis (Lea).
Zonitoides arborea (Say).
Striatura milium pugetensis (Dall).
Pristiloma stearnsi (Bland).
Euconulus fulvus (Müll).

Vancouver Island, near lower end of Cameron Lake, in open pine forest above hotel. Most of the specimens under dead bark on the ground. 1–12/viii/18.

Epiphragmophora fidelis (Gray).
Polygyra columbiana (Lea).
Polygyra germana vancouverinsulæ P. & C.
Haplotrema vancouverensis (Lea).

Haplotrema sportella (Gld.).
Zonitoides arborea (Say).
Zonitoides cookei Pils.
Polita hammonis (Strom).
Striatura milium pugetensis (Dall).
Pristiloma stearnsi (Bland).
Euconulus fulvus (Müll).
Punctum pygmæum (Drap.).
Vertigo columbiana Sterki.
Cochlicopa lubrica (Müll).

Polygyra germana vancouverinsulæ n. subsp. The shell is more openly umbilicate than typical *germana* with a decidedly stronger, higher parietal tooth. Hairs of the surface space very delicate and more or less fully deciduous in adults. Height 4.5 diam., 6.8 mm.; 5¼ whorls.

Cameron Lake. Type 44538 A. N. S. P.; paratype in Bishop Museum, Honolulu. Also found about 4 miles south of Union.

DESCRIPTION OF A NEW ZONITOIDES.

BY H. A. PILSBRY.

Zonitoides cookei n. sp. Fig. 1.

The shell is discoidal, the spire very slightly convex, umbilicus regularly diminishing inward, very nearly one-fourth the

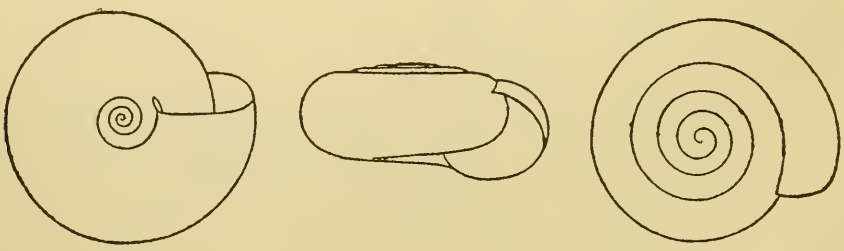

Fig. 1. Zonitoides cookei.

diameter of the shell; whitish, glossy, smoothish, under the microscope showing faint growth lines and on the upper sur-

face an excessively minute, close and shallow spiral striation on the last 2 or 3 whorls. The whorls increase slowly and are rather convex, the suture rather deeply impressed, last whorl rounded peripherally. The aperture is rather narrow, crescentic. Height 1.7, diam. 3.6 mm.; 4½ whorls.

Cameron Lake, Vancouver Island. Type no. 130623 A. N. S. P. Specimens also contained in the Bishop Museum.

This species is distinguished by its very low spire of narrowly coiled whorls, and especially by the narrow aperture. The generic reference is uncertain, as we do not know whether it possesses the *Vitrea* or the *Zonitoides* type of teeth, and the shell characters are not decisive. However, the suture is deeper than in our small species of *Vitrea* or *Polita*. Named for Dr. C. Montague Cooke.

SOME NOTES ON MINUTE PISIDIA.

BY V. STERKI.

Recently Mr. A. W. Stelfox kindly presented me with a few fine specimens of *Pisidium torquatum* Stelfox, with a note saying that they are what B. B. Woodward[1] has described as *parvulum* Clessin. That species is well established and distinct, to judge from Clessin's[2] description and figures, though both somewhat inadequate, and from authentic specimens. From Woodward's description and figures, l. c., it is evident that his *parvulum* is an entirely distinct species, which Stelfox has named *torquatum*. Woodward's specimens were from Denmark and he stated that the species had not been met with in the British Isles, either recent or fossil. That is evidently to be understood of both, *parvulum* Clessin and the one described by him. As stated by Stelfox, his specimens, from England, resemble the Nearctic *P. punctatum*, as to size and shape; they are 1.5 mm. long, well

[1] Catalogue of the British Species of Pisidium in the British Museum, 1913, p. 105. Pls. II, f. 6, IV, f. 8, XVII, fs. 3–6.

[2] Cycladeen, in Küster and Chemnitz, 1879, p. 17, Pl. 1, fs. 17–21.

inflated, mature or very nearly so, and have a slight ridge on each beak. But the hinge is quite different, much like that of *cruciatum* St.,[1] stout, with the plate broad, the principal laminæ ("lateral teeth") massive, and a short ligament. The right cardinal, c 3, is of the same peculiar formation; its posterior part curving downward and apparently forward, merging into the projecting edge of the plate (an equivalent of the hypothetical c 1 *?*), thus forming a well-enclosed groove for the reception of c 2, the left anterior cardinal. The latter is much smaller than in *cruciatum*, and so is c 4. The lamina a I, especially, is short and considerably projecting inward; a III is wanting, as it is in some *cruciatum*, and p III is quite small and rather proximal. These features are in marked contrast to those shown in the figures of "*parvulum*", in Woodward's, l. c., and so far as present evidence shows, the two appear to be distinct species, even of different groups.

For over thirty years[2] *P. cruciatum* has held a unique position among the known species and forms, by its peculiar hinge formation and the shape of its umbonal ridges, which, by the way, are quite constant, unlike those of *P. compressum*, *fallax* and *punctatum*, also *supinum* A. Schmidt and *henslowanum* Sheppard, which are vestigial or wanting in some forms. Probably the species is of an old race, or group, now isolated, and the more it is interesting to know of a related form from east of the Atlantic.

Of other minute Nearctic *Pisidia*, 1.5 to 2.2 or 2.5 mm. long when mature, there are now about a dozen known, well established, most of them distributed over wide areas, and of quite different groups. Temple Prime has described three of them, in 1851.[3] Of about half as many somewhat larger ones there

[1] *P. cruciatum* and *punctatum*, THE NAUTILUS, VIII, pp. 97–100, Pl. II, fs. 1–13 (Jan., 1895).

[2] *P. cruciatum* and *punctatum*, also *fallax*, were first found, or noticed, in 1891, among coarse gravel and sand of the Tuscarawas River, Ohio.

[3] The size given to *P. ferrugineum* (see Mon. Corbiculadæ, p. 71), 4.25 mm. long, is a mistake, or error; of thousands of specimens seen, all are quite small.

are minute forms and subspecies; and some others have been under doubt and scrutiny for years. Large numbers of specimens have been overlooked or thrown away by collectors supposing them to be merely young and of no value. In fact, the young of all are of interest.

Critics have not been friendly to these small forms. To cite one example: Prof. Richard Ellsworth Call[1] says: "The young [of Pisidia] are found in older shells in the spring and again in the fall, and have recently been described in the 'NAUTILUS, an amateur conchological journal, under a number of names." This dictum evidently applies in first order to *P. cruciatum* and *punctatum.*[2] From the figures, any amateur beginner, or any school boy, could see that the mussels were full grown; the same is shown by the hinge. In the second place, their young are also figured on the same plate. In the third place, large numbers of specimens at all stages of growth had been collected and examined for four years before the descriptions were published. Be it added that those two species are as distinct and valid as any in the animal kingdom, now known to be widely distributed, recent and fossil. If a man wants just to condemn, to show his own superiority, he does not want to know facts and shuts his eyes to the plainest evidence.

This, of course, is not a personal matter but one of principle. If, after careful revision and comparison, a species is believed not to be distinct and valid, it is fair to say so and state the reason. But "wholesale" condemning without even an attempt at considering evidence, means undue discrediting of the whole work done on a subject. It is hardly necessary to add that the small and minute forms of *Pisidium* are of as much interest, at least, as the larger ones, with respect to morphology, systematics and distribution.

[1] A Descriptive Illustrated Catalogue of the Mollusca of Indiana, written in 1898, in Indiana, Department of Geology and Natural Resources, Twenty-fourth Annual Report, 1900, p. 437 (also 358).

OBSERVATIONS ON THE GENUS MARGARITANA WITH A NEW SUB-GENUS.

BY L. S. FRIERSON

The type species of this genus, *M. margaritifera*, does not live in waters having any considerable amount of lime in solution, which fact has not perhaps been given its due weight in the explanation of the great gaps in the territory occupied by it, such as almost the whole of the central portion of Northern America.

This unoccupied territory is usually explained upon the theory of the glacial age, but it is hard to understand why the ice-covered regions were not repopulated *pari passu* with the melting of the ice sheets. There are two closely akin species living in America, separated by the space between Pennsylvania and Alabama, and Utah and Louisiana, these being the *margaritifera* and *hembeli*.

The latter species is generally supposed to live in the waters adjacent to New Orleans, since Conrad's original *envois* came from that city, but the collector, Dr. Hale, lived also in Alexandria, near which place the great alluvial deposits of the Red and Mississippi rivers join the sandy, pine clad hills of Louisiana, and from one of the "clear water" creeks flowing out of these hills, the writer has obtained numbers of Conrad's shell, and it is almost certain that this creek is the type locality.

From a similar environment Mr. B. H. Wright obtained the same species in Alabama, i. e., from the lime free creeks of the pine hill section. The Alabama shells are heavily sculptured, but these from Louisiana are often quite smooth, and the resemblance to the type is striking.

Three species occur in Europe, (to which dozens of names have been affixed). These are the *margaritifera*, whose lateral teeth are almost obsolete; the *crassa*, whose laterals are quite well developed, and the *auricularia*, of Spengler, recently rediscovered by Dr. Haas in Spain. The latter appears to be the analogue of *M. hembeli* in being sculptured, and like the latter, grows in the southern portion of the range.

In the Chinese territory three or four species exist, of which however but two are listed as such in the current literature.

The type species has as usual received several names, but preserves its identity remarkably well.

The *Margaritana laosensis* Lea in having well-developed laterals, may be said to be the analogue of the *crassa*.

In this genus also belongs one, certainly, and possibly three or four species which have been placed in other genera, as will be shown.

MARGARITANA MURINA (Heude), 1877.

Unio murinus Heude.
Ptychobranchus murinum Simpson, 1900.
Unio compressus Simpson (*non* Heude), 1900.

That Heude's *Unio murinus* is a member of *Margaritana* is shown in its close agreement in shape, in its color, both of epidermis and nacre; in its obsolete and short lateral teeth, and perhaps most strikingly, in the characteristic elongate-elliptical posterior adductor scars. *Ptychobranchus pfisteri* has differently colored epidermis and nacre; its laterals are well developed, and, as Heude observed (subsequently) its lateral teeth and ligament are of equal length, and the posterior adductor is short and nearly round. Heude states that the beaks of *murinus* are widely and profoundly undulated, whence the species is made the type of the subgenus *Heudeana*.

MARGARITANA SIMPULARIS (Heude), 1884.

Unio simpularis Heude.
Unio modestus Heude, 1877.
Parreysia simpularis Simpson, 1900.
Parreysia modesta Simpson, 1914.

The dimensions of this species given by Heude would indicate quite an inflated shell, whence Simpson placed it tentatively in *Parreysia*, but no errors are at once so common, so difficult of detection, and impossible of correction as those of concrete numbers, while on the other hand the character given by Heude, "*compressed*", allows no compromise. Heude com-

pared his species several times later on, and he states that it resembles the *murinus*, *ect*, and chiefly among other characters, in its obsolete laterals. The species appears to be closely allied to *murinus*, and is probably a variety of it. Heude changed his first name, since that was preoccupied, and this was followed by Simpson in his Synopsis of 1900, but in his Catalogue of 1914 he uses the name *modesta*, on the ground that the *modestus* Fér. not having been described by Férussac, was a *nomen nudum*. Simpson forgot the *Unio modestus* Küster, 1856.

The *decumbens* Lea, is usually listed as a member of *Margaritana*, but Lea's type, which is the single example known, has been carefully inspected by the writer, and it is absolutely nothing more than a pathological specimen of one of the *Unio complanatus* aggregation, and the name should be dropped from lists of valid Naiades.

Specimens before me bearing the name of *Ptychobranchus laevis* Haas, from Saghalien, are unquestionably *Margaritana*, but since they were obtained from a dealer, and I have seen no figure of Haas' species, I hesitate to approximate them, yet they agree with his description very well.

VARIATION IN MOLLUSCA OF THE MADEIRA ISLANDS.

BY T. D. A. COCKERELL.

Boog Watson, in 1892 (Journ. Conch., Vol. VII, no. 1), remarked that the many endemic land snails of the Madeiras were all distinct. "Between themselves there is no swaying of the lines to and fro, they do not bifurcate, they do not pass over from one form into another, they give off no spots maturing into distinct species." In the presence of a large series of these shells it is difficult to see how Watson could have formed such an opinion, as there are in fact numerous "critical" forms. There is also a considerable amount of "individual" or local variation, some examples of which are recorded below. One fact is curious, that no one seems ever to have found a sinistral mutation.

I use the name *Ochthephila* Beck, as it turns out that the genus of Diptera supposed to preoccupy it was called *Ochtiphila*.

Ochthephila (*Tectula*) *bulverii* (Wood) mut. *albescens* nov. Shell greenish-white. Slopes of Pico do Facho, Porto Santo. (A. C. de Naronha.)

Ochthephila (*Discula*) *attrita* (Lowe) mut. *nigra* nov. Shell reddish-black, very dark, with the umbilical region broadly, and the region of the aperture to about 3.5 mm. back of the lip, creamy white; spire obscurely flecked with creamy. South slope of Pico d'Anna Ferreira, Jan. 21, forming a small local colony, but the normal form also present (Cockerell).

Ochthephila (*Discula*) *attrita* race *contracta* nov. Shell small, max. diam. 8.5 to nearly 9 mm.; lip usually very thick, aperture contracted, a heavy callus usually present on parietal wall. I. Baixo, Jan. 22 (Cockerell), and practically the same thing in the vicinity of the Pico do Castello on the main island. All the shells are dead and white, and apparently the race is extinct. It appears to be an ultra-xerophytic form. The character of the base readily distinguishes it from *papilio* Lowe, common on Baixo.

Ochthephila (*Callina*) *rotula* (Lowe) mut. *grisea* nov. Shell pale gray, flecked with creamy white; the albino form. Porto Santo, main island, 1921 (Cockerell). Two shells were found.

Euparypha pisana mut. *rosea* Costa, 1879. Shell pale pink, without evident markings. Locally common in one place north of Villa Baleira, Porto Santo, Jan., 1921 (Cockerell).

Euparypha pisana mut. *coalita* Taylor. Shell black, with slender light bands, my specimen somewhat more melanic than Taylor's figure. This was found in the same vicinity as *rosea*, together with other varieties, and it is evident that the peculiarities of color cannot be ascribed to climatic conditions.

Euparypha pisana mut. *taylori* n. n. (*H. pisana* s. v. *donatii* Taylor, Monog. L. & F. W. Moll. Brit. Is., 1912, pl. xxxi, f. 20). I have exactly this form, which Taylor figures from Portugal, from the south side of the Pico d'Anna Ferreira, Porto Santo, Jan. 11, 1921 (Cockerell). Taylor also figures it as var. *carpiensis*, but it is quite different from true *donatii* or *carpiensis*. Gwyn Jeffreys (Brit. Conchology) reported *H. virgata* from

Madeira, where it certainly does not occur. The present variety may have been taken for it.

Lemniscia calva (Lowe) race *veterna* nov. Shell 11 mm. max. diam., sometimes as small as 9.5 mm. Pleistocene fossil in the beds east of Caniçal, Madeira, common. It is not certain that *calva* belongs to *Lemniscia*. Paiva's *galeata* is congeneric with *calva*. In the Norman collection at the British Museum, specimens of *calva* are labeled *galeata*.

NOTES ON THE NAIAD FAUNA OF THE UPPER MISSISSIPPI RIVER.*

II. The Naiades of the Upper Mississippi Drainage.†

BY N. M. GRIER AND J. F. MUELLER.

While it was the original intention to limit this list to those species actually found in the Mississippi river above its junction with the Ohio, the fullest consideration of the topic has led us to include all species authentically reported from the entire Upper Mississippi Drainage. The larger number of the listed species were collected while the writers were engaged in Mussel Survey and Appraisal work for U. S. Bureau of Fisheries in part of that region during the summer of 1920. The remaining species in the list have been obtained by the rechecking of the available literature dealing with or bearing upon the Naiades of this region as indicated in the accompanying bibliography. Species having an apparently doubtful or accidental record have been omitted. The nomenclature used is that recently formulated by Ortmann and Walker (12), but for convenience there is also added the equivalents of the different species in the synonomy of Simpson. (14)

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†Contribution from U. S. Biological Station, Fairport, Iowa, and Biological Laboratory Washington and Jefferson College.

Family MARGARITANIDAE Ortmann.

1. *Margaritana monodonta* Say.

Simpson—Illinois and E. Iowa. Similarly reported by Baker (1), and Call (3), from the same regions. We did not find it above this region.

Family UNIONIDAE (D'Orbigny), Ortmann.

Sub-Family UNIONIDAE (Swainson), Ortmann.

2. *Quadrula pustulosa* (Lea).

Simpson—entire Mississippi drainage. Common. Wilson and Danglade (18), St. Croix drainage.

3. *Quadrula pustulosa prasina* (Conrad)=(var. *schoolcraftensis* Lea)

Geiser (5), and Call (3), report this shell from Iowa. We did not encounter it north of there. Reported by Lapham (9), from Fox River.

4. *Quadrula nodulata* (Raf.)=*Quadrula pustulata* (Lea).

Simpson—Mississippi R. and tributaries from E. Iowa south to Louisiana. We did not collect this species. It is found abundantly at Fairport, Iowa in the main river.

5. *Quadrula quadrula* (Raf.)=*Quadrula lachrymosa* (Lea).

Simpson—entire Mississippi drainage. St. Croix drainage. Casually distributed.

6. *Quadrula fragosa* (Con.).

Specimens are known from Iowa City, Iowa, Cedar River, Ia., and from the Spoon, Kaskaskia, Illinois and Mississippi Rivers, Illinois. Closely related to the preceding species. *Vide* Strode (15).

7. *Quadrula verrucosa* (Raf.)=*Tritogonia tuberculata* (Barnes).

Simpson. Mississippi drainage area generally. Red Wing, Minn. Reported from S. Minnesota by Lapham (9), and Call (3). Not common.

8. *Tritogonia nobilis* (Conr.).

Simpson reports this shell from the Red River of the North to Mississippi. We did not collect this shell, although the Bureau of Fisheries has it recorded from L. Pepin.

9. *Quadrula metanevra* (Raf.).

Simpson—Mississippi drainage area except its southern portion. Southern Minnesota (7). Red Wing. Abundant locally.

10. *Quadrula metanevra* var. *wardii* (Lea).

Reported by Simpson from Iowa.

11. *Megalonaias gigantes* (Bar.)=*Quadrula heros* (Say).

Simpson—Mississippi drainage area generally. Rare in L. Pepin and more plentiful above than below it.

12. *Amblema costata* (Raf.)=*Quadrula undulata* (Barnes).

Simpson—Mississippi drainage area generally. Wilson and Danglade (18), St. Croix drainage. Common. Believed by H. W. Clark to be another tributary stream species.

13. *Amblema peruviana* (Lam.)=*Q. plicata* (Say).

Simpson, Upper Mississippi south to Arkansas, etc. Wilson and Danglade (18), St. Croix drainage.

14. *Fusconaja ebenus* (Lea)=*Quadrula ebenus* (Lea).

Simpson, Mississippi drainage area generally, except western portion. Apparently does not go into N. and C. Minnesota. We collected it at Red Wing, Minn. No longer common.

15. *Fusconaja flava* (Raf.)=*Q. rubiginosa* (Lea).

Simpson—entire Mississippi drainage. Wilson add Danglade (18), Red River of the North. A tributary stream species.

16. *Fusconaja undata* (Barnes).

Simpson—entire Upper Mississippi drainage. Var. *trigona* (Lea), seemed especially abundant in L. Pepin. Reported from N. and C. Minnesota. Common.

17. *Cyclonaias tuberculata* (Raf.)=*Q. tuberculata* Raf.

Simpson—Mississippi drainage area generally. This species was formerly more abundant in certain areas of the Upper Mississippi, but is now clammed out. According to Clark this is another headwater, tributary stream species.

18. *Cyclonaias granifera* (Lea)=*Q. granifera* (Lea).

Simpson—northwest to Iowa. Baker (1), found it at McGregor, Iowa. Clark reports this species from L. Pepin to Fairport.

19. *Plethobasus cyphyus* (Raf.)=*Pleurobema aesopus* (Green).

Reported by Grant (6) and Holzinger (7) from Minnesota. We encountered our first specimen of it at the foot of L. Pepin. Comparatively rare and more abundant at present in the sloughs.

20. *Pleurobema cordatum* (Raf.)=*Q. obliqua* (Lea).

Reported by Baker (1) from Iowa. Specific localities are desirable. Probably more southern in distribution. Ortmann considers this species as not specifically different from *Pleurobema coccineum* (Con.).

21. *Pleurobema catillus* (Conr.)=*Q. solida* (Lea).

Simpson, Mississippi R. north to Minnesota. Collected above Red Wing. According to Wilson and Danglade (18) no "Quadrulae" are found in the Mississippi River proper above the falls of St. Anthony, a fact which has a bearing upon the distribution of all mussels of the *Quadrula* type in these regions.

22. *Pleurobema coccineum* (Con.)=*Q. coccineum* (Con.).

Simpson—entire Upper Mississippi drainage. Wilson and Clark, drainage of Red River of the North. We did not encounter it. It is apparently a small tributary species.

(*To be continued.*)

RAMBLES OF A MIDSHIPMAN II.

BY P. S. REMINGTON, JR.

After leaving Guantanamo, Cuba, the squadron headed south for the Panama Canal. We passed within sight of Jamaica but did not stop, much as I should have liked to collect there. For several days we drove steadily on, manoeuvring as we went. It was a most maddening sight to me after we had made a good day's run, to see the Admiral mount the bridge and commence sending up signals for manouvres which would turn us about and start us back toward Cuba. However, schedules are inflexible things in the Navy, and we must not arrive ahead of time.

At length we awoke one morning to see the white-topped mountains of Panama coming in view over the horizon, and

already we could see the indigo-blue so characteristic of the Caribbean, beginning to turn gray as we got in closer to shore. In a few more hours we were dropping anchor just inside the breakwater at Colon, and viewed the low buildings and palm-fringed shore with much interest. Alas, before we could go through the Canal we must coal ship, a job which everyone, from skipper down, cordially hates. Everyone turned out in his dirtiest clothes, officers and all, and shoveled down the shutes the never-ending piles of coal that the big cranes dropped on board. It is remarkable how much coal can be stored in a battleship. By noon next day we were through cleaning ship, and the first liberty party went up the Canal to Gatun to examine the locks and the dam. We were also taken to Coco Sola Point and shown the Atlantic defenses of the Canal. Those huge disappearing guns seemed mighty formidable to us.

When word came that we were going through the Big Ditch, all was excitement. I have been through the Canal five times since, but it still holds as much wonder and interest for me as it did the first time, and I should like to go through again. The Gatun locks, which raised us from sea level eighty-two feet to the level of Gatun Lake, are a marvel of engineering skill. It seemed strange to see a whole squadron of battleships steaming through a lake far inland, with forests and hills on either hand and pelicans flying around our boys. There is room for several more squadrons of battleships to anchor also in this great lake, made by the damming of the Chagres River. Culebra Cut, with its sheer walls towering above our fighting tops, held our interest no less than the lake had. By late afternoon we had completed our voyage from the Atlantic to the Pacific, and passed out into the latter to dock at Balboa.

On my first visit to the Canal Zone in 1919 I did not know, unfortunately, that that very efficient collector, Mr. James Zetek, was a resident of the Zone. Consequently my attempts at collecting were not well rewarded. I was also handicapped by the lack of time. We were all taken on an official party to Flamenco Island to see the Pacific defenses, and while there I strayed off to examine the breakwater for shells. What was my delight to find the rocks covered with fine large specimens

of *Chlorostoma pellis-serpentis!* Further search revealed some very fine *Planaxis planicostata* and many large-sized *Nerita ornata.* The rocks were paved with large *Chiton stokesii.* The number of specimens I was able to carry was limited to what I could stuff in my pockets, as I had brought no receptacle of any kind and we were in an official party. I managed to bring away a very fair representation, however. That matter proved far less difficult than the business of cleaning them. I finally gave it up, wrapped the shells in paper, and sealed them in tin boxes.

This was all the collecting I was able to get in on my first trip, as we steamed back through the canal the next day, bound for Cuba again.

On my second visit to the Canal Zone the following year, I had the forethought to write to my old correspondent, Mr. E. P. Chace, of Los Angeles, asking if he knew of any collectors in the Canal Zone. At his suggestion I wrote to Mr. James Zetek, who kindly assured me of a warm welcome on my arrival. As we were to spend several days at Balboa, I felt certain of seeing more of the conchological treasures of Panama than I had on my first trip.

My expectations were fully realized. Once more we steamed through Gatun Lake and between the narrow sides of Culebra Cut, and docked again at the now familiar Balboa. As soon as I got shore leave, I called up Mr. Zetek and was told to come right up to his laboratory at the Public Health Department of the Ancon Hospital. I shall always remember the kindness with which he welcomed me and placed the facilities of his laboratory at my disposal. He set aside his work for the day and took me on a collecting trip to Bella Vista, where he has made so many rare finds. Not the least enjoyable part of the trip was our visit to a mangrove swamp, where we found thousands of *Cerithidea montagnei* and *C. pulchra*, together with *Littorina varia* and a fine specimen of *Linatella wiegmanni.* Deep in the mud, we could hear the *Arcas* snap their valves. Soon we came out on the beach where a wealth of species rewarded our search. Here we found three species of *Thais*, four *Anachis*, several *Cerithium*, *Turritella*, *Nerita*, *Litorina*, *Natica*, *Arcularia Solen*, *Paphia*, *Anomalocardia*, and many others. We filled our

bags till we were weary, and the sun began to get low. Realizing that we had several hours work ahead of us to clean our catch, we hastened back to the laboratory after supper and worked till late.

A rather humorous incident, which always brings a smile when I recall it, took place on my return to the ship. It seems that the Officer of the Deck had orders to open all packages brought aboard to ascertain that no liquor was being smuggled aboard (Panama is as wet as the ocean). Consequently when I came over the gangway with my big box of shells, I was stopped and asked what the package contained. Visions of having my box opened to the vulgar gaze of the laity arose before me, and I desperately sought for means to ward off such a disaster. Finally, I summed up my courage and answered: "Sir, on my honor as a Midshipman, I have no liquor in my possession." The officer smiled and passed me on!

The next day I had the pleasure of taking dinner with Mr. Zetek and his family and enjoyed a meal cooked Panama style. Afterward I spent an enjoyable afternoon inspecting part of Mr. Zetek's collection, and was presented with a large number of his duplicates, making together with what I had collected, a very fair representation of Panamanian fauna. Mr. Zetek's remarks on the history and customs of Panama were highly interesting.

It would be a waste of time to give a list of the species collected at Panama, as Mr. Zetek's list is more complete on that point than mine would be. I refer my readers to that for more complete information.

All too soon we weighed anchor for Honolulu, a sixteen days' run, and rapidly left the jungle-clad hills of Panama behind. I was comforted, however, in my regret at leaving so congenial a country, by the knowledge that we were due to coal again at Balboa on our way back to the States, and that I would have at least one more try at the wonderful shell fauna of Panama. For the present, it was westward ho, and we all settled down to our long voyage toward the alluring isles of hula maidens and *Achatinellas!*

AN INDICATION OF THE VALUE OF ARTIFICIAL PROPAGATION OF PEARLY MUSSELS

BY R. L. BARNEY

Director U. S. Fisheries Biological Station, Fairport, Iowa

In 1913 there was practicalized through the investigations of Drs. George Lefevre and Winterton C. Curtis of the University of Missouri, an artificial method of propagation of fresh-water mussels. The method, based on the peculiar natural history of the mussels—especially on the parasitism of fishes by the embryo mollusks—is artificial only in that it requires the handling of the proper host fishes and the embryo mussels. The artificial propagative method is, indeed, merely assistance lent the natural reproductive processes, but by such assistance the plan results in a thousand fold increase over unaided reproduction. Complying with the requirements set by the natural propagative process of the mussel, the artificial method is simply the collection of a large number of fishes of appropriate species, their temporary confinement in a large receptacle of water, and the introduction into the water of a million or two glochidia (embryo mussels) of the mussel to be propagated. These glochidia are taken directly from the marsupia of a "ripe" gravid female shell. Within perhaps five or ten minutes the fishes so confined are quite heavily parasitized by the glochidia and, with an infection of possible 3,000 or more glochidia,—the amount of parasitism depending on the size of the fish, the temperature of the water, and other factors,—they are liberated into the water of their natural habitat where in due season the fully-matured embryos free themselves of their hosts and, dropping to the bottom, take up life as independent organisms.

This method of propagation has been carried on yearly since 1913 with a view toward repopulating the depleted mussel beds of several streams of the Mississippi drainage and, therewith, to furnish a continual supply of raw material for button manufacture.

During the past fall data have come to hand which suggest,

within certain limits, the value of this method of mussel propagation.

In 1913 propagating crews operating on the White River, Arkansas, under the direction of the U. S. Fisheries Biological Laboratory, Fairport, Iowa, liberated in that stream 4,500,000 embryo yellow sand-shells (*Lampsilis anodontoides*) on this species' hosts, the long- and short-nosed gars (*Lepisosteus osseus* and *platostomus*). The following two years there were liberated respectively 743,000 and 309,000 embryos of this mussel in the parasitic condition. After 1917 the propagation of the yellow sand-shell was discontinued because of inability to obtain gravid females of this species at the times when the crews operated on this river. When this work was done, the primary purpose of the propagation was to increase the muckets (*Lampsilis ligamentina*) of the river. This mussel may be propagated during seasons when it is impossible to obtain gravid sand-shells.

Through the kindness of Mr. F. C. Vetter, President of the Hawkeye Pearl Button Company, Muscatine, Iowa, there has been obtained shell-test records of 61 carload shipments of commercial shells from Augusta, Arkansas, on the White River in the vicinity of which town the sand-shell has been propagated. These tests covered shipments received by the company during the period from 1915 to 1821 inclusive. The test records of this company were taken on its own initiative and for its own purposes. Each record represents a single sample or two samples of 100 pounds each of the button shells as they arrived at the cutting plant in Muscatine. The samples were made by a shell-sorter and were taken as an index of the average assortment of shells of the different commercial species in the carloads and on the river bottom from which they came. A record has been kept of the percentage of yellow sand-shells, niggerhead shells (*Quadrula ebenus*), pimplebacks (*Q. pustulosa* and *pustulata*), washboards (*Q. heros* and *plicata*), and of miscellaneous shells, pigtoes (*Q. undata*), mapleleafs (*Q. lachrymosa*), etc.

TABLE I

ARTIFICIAL PROPAGATION OF THE YELLOW SAND-SHELL IN THE WHITE RIVER, ARKANSAS, AND ITS FREQUENCY IN COMMERCIAL SHELL SHIPMENTS FROM AUGUSTA

Year	Artificial propagation with sand-shell glochidia	Carloads	Per cent of yellow sand-shells in commercial shipments	Per cent of niggerhead sand-shells in commercial shipments
1913	4,500,000			
1914	743,000			
1915	309,000	3	[1] 0	[1] 76
1916	34,000	10	[2] 6.1	[2] 59
1917	11,000	4	7.2	56
1918	. . . . .	8	9.2	45
1919	. . . . .	10	11.6	49
1920	. . . . .	10	7.2	55
1921	. . . . .	16	6.7	47
Average. . .	. . . . .	. . . . .	[3] 7.3	[3] 51.3

Table I shows the extent of propagation of the yellow sand-shell during the period of years considered and the percentage of shells of this species and of niggerheads in carload shipments from Augusta, Arkansas, to the Hawkeye Pearl Button Company, Muscatine, Iowa. These two mussels are the only two species considered inasmuch as the others are of minor importance because of their comparatively much lower frequency and because of their smaller commercial value. Test records were begun by the button manufacturing company in 1915. Records of percentages of shells in shipments previous to this time are not available. Figures representing percentages of yellow sand-shells and niggerhead mussels are the averages of the test records taken during the given years. The 1915 record for

[1] Special shipment of three carloads containing no yellow sand-shells; these were sorted out for foreign shipment.

[2] Figures based on eight carloads; two of the ten carloads of this year were special carloads containing no yellow sand-shells.

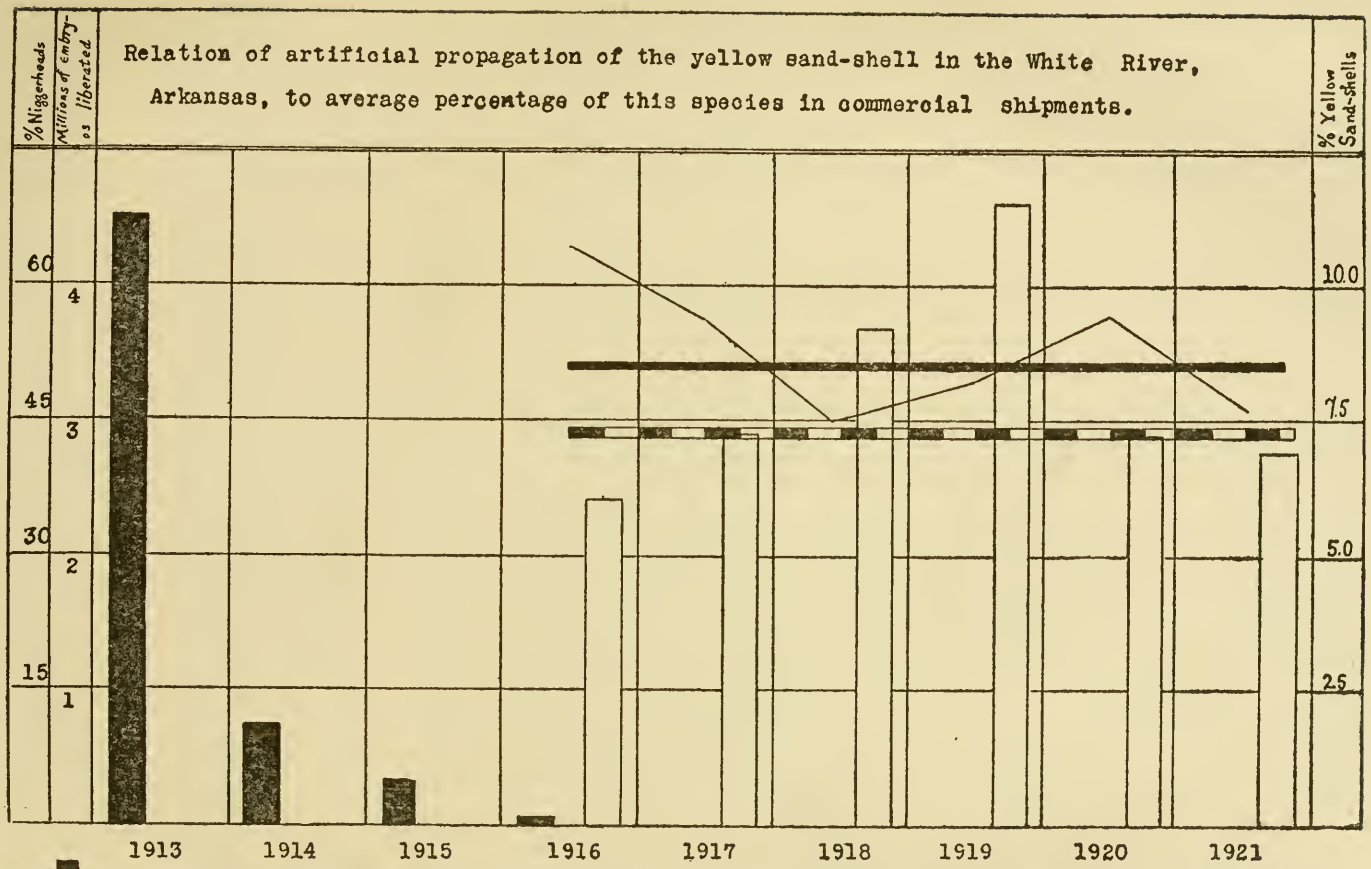
[3] Omitting 1915 and 1916 special shipments.

niggerhead shells covers three shipments of that year of certain special carloads of shells sorted by the clammers to give a higher count of niggerhead shells and thus a better money return. The sand-shells were kept separate for sale to foreign shippers and, therefore, none were included in the shipments. The 1916 record also contained two similar carloads, but these have not been included in the computations.

From table 1 there is noted from 1917 through 1919 a marked increase of yellow sand-shells in carloads shipped from Augusta. This increase is, at its maximum, 4.4 per cent over the percentage of 1916 and 4.3 per cent over the average record of yellow sand-shells in 56 carloads. The increase in sand-shells cannot be due to special fishing and therefore to proportionately lowered frequency of the niggerhead mussel (the original and still the best pearl-button shell) inasmuch as the record for this species shows an increase in frequency of this shell during 1918 and 1919 during the years of marked increase in frequency of the yellow sand-shell. This increase in sand-shells occurred when the niggerhead frequency had been about its average frequency, 51.3 per cent.

The return of the frequency of yellow sand-shells in 1920 and 1921 to about normal percentage, 7.2 and 6.7 per cent respectively (the average being 7.0 per cent), would reasonably be expected in view of the marked decrease in artificial progagation after 1914. If the increase in percentage of yellow sand-shells found in 1918 and 1919 were due to artificial propagation, it would be fairly expected that when artificial propagation was discontinued, there would be, a proper number of years hence, a resultant falling-off in frequency of the mussel in question.

The marked yellow sand-shell increase of 1918 and 1919 is significant coming as it does from four to six years after the artificial propagation of this species in the vicinity from which the shipments here discussed were made. At the average growth-rate of the sand-shell, it requires from four to six years for a mussel of this species to attain salable size. This rate of growth would make an embryo of 1913 a mussel of commercial size in from 1917 to 1919.


% Niggerheads
Millions of embryos liberated
Relation of artificial propagation of the yellow sand-shell in the White River, Arkansas, to average percentage of this species in commercial shipments.
% Yellow Sand-Shells
60
45
30
15
4
3
2
1
10.0
7.5
5.0
2.5
1913
1914
1915
1916
1917
1918
1919
1920
1921
Artificial propagation of Yellow Sand-shell.
Average percentage of Yellow Sand-shells in commercial shipments.
Average frequency of Yellow Sand-shells in carload shipments, 1916-1921 inclusive.
Average percent. of niggerhead shells in commercial shipments.
Average frequency of niggerhead shells in carload shipments, 1916-1921 inclusive.

While no data are at hand indicative of the comparative ages of the shells of the several years' shipments, it is learned from a number of shell buyers on the White River in the vicinity of Augusta and from others acquainted with the shipments here discussed that those of 1918, 1919 and 1920 contained a noticeable increase of shells of relatively young age, the epidermis of which is smooth and unscarred, in contradistinction to the old shells whose umbones are worn and eroded by the long action of the current, soil acids, and moving sand and gravel on the river bottom. On the test-record card of one of the carload shipments of 1920 was written, "Lots of good sand-shells."

It was conversation concerning the quality and age of the shells being obtained from the White River that led to the comparison of the records of artificial infection with the test records of the shipments.

The evident correlation existing, then, between time of artificial propagation, rate of growth and age of attainment of salable size, and noted increase in percentage of the species in question in commercial carload shipments, while not giving conclusive proof of the value of artificial propagation, does suggest the possible significance of this method of restocking the mussel beds of the streams of the Mississippi drainage.

TWO NEW BIVALVES FROM ARGENTINA

BY W. H. DALL

In a recent sending from Doctor Felippone of Montevideo, the following shells appear not to have been described. Both come from Mar de la Plata, Argentina.

PECTEN (CHLAMYS) FELIPPONEI n. sp.

Shell rounded, the adult slightly oblique, rather compressed, polished, scarlet or rosaceus, usually with zigzag irregular streaks of white on the left valve; the ears paler; hinge line straight, the ears rather large, subequal, in the left valve with only incremental sculpture, in the right valve the anterior ear has four or

five radial ridges more or less imbricated, and a ctenolium with five short teeth; sculpture of the left valve comprising five obscure flattened radial ribs with the interspaces obscurely radiately striate; there is no microscopic reticulation; on the right valve the ribbing is obsolete; length of shell 38; of hinge-line 28; height 40; diameter 8 mm.

The shell bears some resemblance to Kobelt's figure of *P. danicus* in the Conchylien Cabinet, but is on the whole a remarkably distinct species. The material studied comprises a well-known left valve (U. S. Nat. Mus. Cat. No. 333374) and in Dr. Felippone's collection another (1706) somewhat smaller, and a complete young pair (1709).

MACOMA (PSAMMACOMA) PLATENSIS n. sp.

Shell bluish white, slightly inequivalve, nearly equilateral, the posterior end strongly twisted to the right; periostracum thin, pale, mostly dehiscent; beaks inconspicuous; left valve somewhat more inflated than the right; the anterior end evenly broadly rounded, the posterior end attenuated, gaping, and with a small truncation; the surface except for incremental lines, stronger on the posterior slope, is smooth but not polished; hinge with small almost obsolete cardinals in each valve; pallial sinus deep, rounded, its lower part coincident with the pallial line for about half its length; length of shell 25; of the part anterior to the vertical of the beaks 13; height 11; diameter 7 mm. U. S. Nat. Mus. Cat. No. 333375.

The shell has much the outline of *Macoma derelicta* Bertin, but is more delicate and with no color markings.

REVIEW OF MARINE MOLLUSCA FOUND ABOUT NEW YORK CITY.

BY ARTHUR JACOT.

Having finished collecting in the vicinity of New York City, I find there are several species to add to the lists published in the "NAUTILUS" during 1919 and 1920. Several of these additional species were found in the channel behind or to the

north of Long Beach (west end) and more careful search should bring to light still more.

Arca ponderosa Say. Rarely a somewhat worn valve may be picked up on Far Rockaway or Long Beach.

Lyonsia hyalina (Conrad). This was also found at Seaside Beach, S. I. It does not seem to frequent the hard ocean beaches and should be procurable on the north shore of Long Island on clean sand beaches.

Venericardia borealis (Conrad). Also at Long Beach.

Cardium mortoni Conrad. Two valves at Long Beach.

Petricola dactylus Sowerby. One set of valves between South and Midland Beaches. Because of its rarity the habitat relation to *P. pholadiformis* was not determined. From this latter it differs by being much deeper for its length, heavier and stouter, lacking the raised, free scales and having a greater number of transverse riblets.

Tellina tenella (Verrill). One valve at Long Beach also.

Tellina versicolor De Kay. Occasional at Long Beach also.

Macoma balthica (Linné). One valve at Long Beach in north channel. This species prefers to live in mud.

Macoma tenta (Say). One valve at South Beach, S. I.

Donax fossor Say. Mostly at Far Rockaway. Fairly common at one spot.

Donax variabilis Say. Found with the preceding and in equal abundance. This seems to be near the northern limit of this species and the valves are quite small and lack the brilliant colors of specimens from the south. The average length of shells from this region is 14 mm., the average length of shells from North Carolina is 17 mm., and for Florida still longer. The differences do not warrant a subspecific designation as intermediate material can be procured at intermediate localities, the locality record being sufficiently designatory. *D. fossor* shows less local difference than does *D. variabilis.*

Mesodesma arctatum (Conrad). Rare at Far Rockaway and Long Beach.

Corbula contracta Say. Found also at Long Beach.

Pyramidella fusca (C. B. Adams). Also found at Long Beach.

Epitonium humphreysii (Kiener). One specimen in channel north of Long Beach.

Polinices immaculata (Totten). Two fossil-looking specimens thrown up by dredge in Long Beach channel.

Alectrion fretensis (Perkins). I have never collected this species but have seen specimens collected on the north shore of Long Island. It is related to *A. vibex* but is strikingly different being much narrower and less finely sculptured.

Haminea solitaria (Say). Long Branch channel, one specimen.

The total number of forms found is 98 or 99, so that one may say that about a hundred species should be procurable within the limits of Greater New York. The most favorable localities were found to be the sand flats between South and Midland Beaches, S. I., the Prince's Bay Section, S. I., Far Rockaway and Long Beaches, including the channels to the north of those bars. These localities represent five distinct habitats: protected sandy beach, sod bank and marsh, quiet mud flats, ocean sandy beach and channel, respectively. Two habitats have been omitted: rocky (protected or oceanic) and eel-grass bed. For instance *Acmaea* should be found on the north shore of Long Id. from Sea Cliff eastward as well as *Chaetopleura apiculata.*

In collecting two factors should be borne in mind, namely, that species are very partial to certain factors in their environment so that one must collect from as many different kinds of surroundings as possible, and second, that the further one goes from the cities or centers of human habitation the more complete and natural will be each habitat.

NOTES ON SNAILS DESTROYING CREEPERS AND THEIR EGGS.

BY J. HOOPER BOWLES, TACOMA, WASH.

In the vicinity of Tacoma, Pierce County, Washington, the large land snail[1] is to be found in abundance. So far as I have seen they are strictly confined to the mixed fir and oak woods of our prairie districts, which are practically free from under-

[1] The snails referred to are *Epiphragmophora fidelis* Gray, shells of which were received from Mr. Ralph W. Jackson.—EDITORS.

growth of all kinds. These woods are carpeted with a rather long and handsome green moss, making delightful walking for both snails and human beings alike. The snails live most of the time on the oaks, and I have never seen them on any other kind of tree, although there are several other varieties of deciduous trees, besides the innumerable firs.

The California Creeper (*Certhia familiaris occidentalis*) sometimes unfortunately, often selects the loose rolls of bark on these oaks under which to place their nests. The big snails, during their wanderings over the trunks of the trees, very naturally wander at times into a Creeper nest, but as to this being by accident or design it is impossible to say. At all events the results are the same, as the big shell is sure to break one or more of the eggs, the contents of which it eats. Most often several of the five or six eggs that usually make up a set are left uninjured, but, of course, the parent bird in nearly all cases deserts. At times, however, there are more serious results, in case the bird is incubating. These birds are what oologists term "very close sitters" and often have to be removed by force. On such occasions the bird is apt to hug her treasures until it is too late for her to make her escape, and several times I have found the parent dead in the nest with her broken eggs, the abundance of slime on her feathers giving indisputable circumstantial evidence of how she met her violent end. I know of no other species of bird that is molested by these snails, but to an ardent student of birds' eggs the creepers are more than enough.

PUBLICATIONS RECEIVED.

Pupillidæ. By Henry A. Pilsbry. Manual of Conchology, Vols. XXIV–XXVI, 1916–1921. As Dr. Pilsbry states (1916), "The last general work on the group is over forty years old. Meantime the number of genera and species has greatly increased, and taxonomic ideas have changed so radically that the classification and nomenclature . . . bear little resemblance to those of former works." A provisional list of the subfamilies is given (XXIV, p. X), with a few of the leading genera as examples.

Gastrocoptinæ: Gastrocopta, Hypselostoma, Abida.
Pupillinæ: Pupilla, Pupoides.
Pagodininæ: Pagodina, Aspasita.
Acanthinulinæ: Acanthinula.
Vertigininæ: Vertigo, Nesopupa, Truncatellina.
Orculinæ: Orcula, Lauria.
Strobilopsinæ: Strobilops.

The first, second and fifth of these subfamilies are worked up in the three volumes completed. Considering the above statement it appears to be in place to give an account of the principal groups and genera.

Gastrocoptinæ, in Vols. XXIV and XXV, pp. 1–68, with 16 genera and 277 species, in four main divisions:

Gastrocopta group: *Chænaxis* P. & F. (Arizona), *Gibbulina* Beck (S. America), *Gastrocopta* Wollaston, *Bothriopupa* Pilsbry.

Hypselostoma-Boysidia group (Oriental): *Hypselostoma* Benson, *Anauchen* n. g., *Boysidia* Ancey, *Gyliauchen* Pilsbry, n. g.

Aulacospira-Systenostoma group (Oriental, Philippines).

Abida group (Palearctic, S. African): *Fauxulus* Schaufuss, *Odontocyclas* Schlueter, *Sandahlia* Westerlund, *Abida* Leach, *Granopupa* Bœttger, *Chondrina* Reichenbach.

The Gastrocoptinæ are probably the most interesting and most complex of the subfamilies. Naturally we turn our eyes first on *Gastrocopta*, formerly known as *Pupa*,* then as *Leucochilus*, and *Bifidaria*. "*Gastrocopta* approaches more nearly a world-wide distribution than any other genus of the *Pupillidæ*, if we include Europe, where species existed from Oligocene to Pliocene times. . . ." It is a notable fact that there are no recent Gastrocoptas in Europe, while quite a number of species of *Vertigo* and *Pupilla* are identical or closely related in Europe and North America. The many Nearctic species represent several markedly different groups, one of which has been separated as genus *Chænaxis*. It may be noted, by the way, that our *G. armifera* (Say) is the largest of the genus. The 106 (+ some additional) species are grouped geographically, "as this is more convenient than strictly systematic sequence"; and the same plan has been followed with some other genera.

* As most of the *Pupillidæ;* see Vol. XXIV, p. 267.

Related to Gastrocopta are some eastern Asiatic genera, such as *Boysidia* and *Hypselostoma*, with the spires much lower, and somewhat more remotely than those of the fourth group, especially differentiated and diversified, the principally European *Abida*, *Granopupa* and *Chondrina*, with 44, 17, and 43 species respectively. *Abida* was mostly known as *Torquilla*, and so were partly the others, *Chondrina* also as *Modicella*. The author says (p. 263): "It had been planned to have *Abida* and *Chondrina* monographed by a European conchologist, but this proved to be impracticable under existing conditions. . . . To really write a monograph of them, one should give them some years of investigation. . . . It can only be expected of me that the well-established species be properly defined, and a reliable compilation made from the published literature of others. . . ." And that has been done very well, so far as the reviewer is able to judge, having to some extent collected and studied those forms in Europe. The figures are excellent, as can best be appreciated by comparison with those copied (mostly photographically) from European authors.

It is also to be noted that of this whole Palearctic group no members are known from Nearctia, either recent or fossil.

The second subfamily, *Vertigininæ*, in Vols. XXV, p. 68 to XXVI, p. 106, contains about 255 species of 17 genera, 5 of which are known as fossil only, from the European Tertiaries. All are small and minute, and the group is somewhat difficult to define, conchologically. So far as known the animals have no inferior tentacles. Of the principal genus, *Vertigo*, 82 recent species are described, 33 of which are American, 44 Paleartic, 7 from Japan and eastern Asia, and quite a number are cited from the European Tertiary. A number of the European and American species are closely related, and at least *V. pygmæa* Drap. is identical in both faunas. The only other genera represented in America are *Pupisoma* Stoliczka, of the tropical regions of the old and new continents, and *Sterkia* with 7 species of southern California and Mexico.

Of *Nesopupa* Pilsbry there are 60, and *Pronesopupa* Iredale, 13 species from the Pacific Islands. Of special interest is *Lyropupa* Pilsbry, from the Hawaiian Islands, worked up in collab-

oration with C. Montague Cooke. The 22 accepted species, recent and fossil, have been studied very carefully with respect to their distribution and variation, and we figured on eight plates. *Truncatellina* Lowe, formerly known mostly as *Isthmia*, contains some of the smallest *Pupillidæ*. The 29 described species are distributed over the eastern continents and islands, but unknown from America.

The subfamily *Pupillinæ*, in the rest of Vol. XXVI, has 6 genera, two of which are known as fossil only. Of *Pupoides* Pfeiffer, the 27 species have a wide but discontinuous distribution; 8 of them are American, among them our common *marginatus* Say, and the much discussed *hordaceus* Gabb, from New Mexico and Arizona. *Pupilla* Leach is widely distributed, and the 34 recent species are arranged geographically. At least one, *muscorum* L. is common to both the Palearctic and Nearctic faunas, and is very variable with respect to size and apertural dentition.

The foregoing is a very inadequate sketch of the contents of the three volumes, with about 1050 pages and 107 plates, also a number of text figures. A total of 41 genera, and over 610 species, plus some additional not numbered, means a surprise even for those who have studied the family to some extent. The subject is of exceptional interest with regard to morphology, systematics and distribution, recent and geological. The author has done great work: the arrangement is lucid, the species are generally well defined, there is neither hair-splitting nor lumping; the figures are above praise and will be a great help and inspiration to the student. For years, Dr. Pilsbry has worked out ways of his own in presenting the complex structure of the apertural lamellæ and folds of the *Pupillidæ*.

Is there anything to criticize? By right, a critic ought to know more about the subject under consideration than the author does, in order to do the right thing. There may be differences of opinion on a few minor points, hardly worth mentioning, yet of some importance in using the books.

Vol. XXIV, p. 10 2nd line from bottom, "86–94" should read 86–93. Bottom line, "95–106" should read 94–104.

Page 365 "Pl. 23, figs. 1, 4" should be 1–4.

Page 370, "Pl. 44, figs. 4–8" should be 4, 8.

Vol. XXV, p. 82, 11th line: "parietals" should be *palatals.*

In numerous places in Vol. XXIV, *callus* is spelled "*callous*", probably by a printer's effort for uniformity. The noun and adjective are properly discriminated in the other volumes.

It might be said that there should be a key to the species of every genus and group. But anyone who knows a thing about e. g. *Pupilla* will know that this is practically impossible, on account of the great variation and frequent overlapping of forms. Keys are provided for a majority of the genera. It might also be said that there should be a general list of literature consulted; but the pertinent literature is cited in a condensed way under every head: group, genus, species and form, described.

In conclusion, it is hoped that especially the generic names used in the work will not have to be changed again for a good number of years to come.—V. Sterki.

On Dinocochlea ingens n. gen. et sp., a gigantic gastropod from the Wealden Beds near Hastings. Geological Magazine, LIX, p. 242, 1922. By B. B. Woodward. In a road cutting the presence of certain huge spiral bodies was noticed. On examination were found to be either dextral or sinistral, of many (about 23) slowly increasing whorls, somewhat like an extremely slender Melanian or Turritellid shell. The casts are broken, but indicate a length of about 7 ft. 3 inches, about six times the diameter of the body-whorl. The shell was proportionately very thin. The external moulds in the sandstone were not preserved, so that external characters are unknown. It is certainly remarkable that so huge a fossil escaped notice until now, and that even no probable ancestors or other relatives have been turned up.—H. A. P.

The San Francisco Bay Marine Piling Survey, 2nd Annual Report. Published by the S. F. Bay Marine Piling Committee, San Francisco, Jan., 1922. The present report is mainly occupied with a consideration of the several piling materials and methods of preserving piles and timber. The biological section,

by Dr. Charles A. Kofoid and Robert C. Miller, deals with *Teredo* in the Bay in 1921, factors limiting distribution and specific status. The species is identified as *Teredo navalis*. The larvæ were observed to settle from July 20 to Nov. 15, but in 1919–20 the breeding season began several months earlier.

The Journal of Conchology, Vol. 16, No. 9, June, 1922. Notes on the Nomenclature of Hygromia, Helicella, etc. By Hugh Watson, pp. 277–285.

Acanthinula lamellata var. albida and A. harpa near Sweden. By Berthold Sundler, p. 285.

A peculiar form of Hygromia fusca from near Bristol. By D. Baechus, p, 286.

The significance of dominant Enadeniate Helices in Africa. By J. W. Taylor, pp. 288–290.

Two Molluscan Associations in North-east Staffs. By W. W. Alkins, pp. 291–297. (1. *Helix nemoralis* and *H. horsensis*, 2. *Balea perversa* and *Clausilia bidentata*.)

The South Devon race of Hygromia limbata. By H. C. Huggins, pp. 297–301.

On Alopia cyclostoma (Bielz), A. canescens (Charp.) and A. deaniana n. sp. By Rev. Dr. A. H. Cooke, pp. 302–306, pl. 9.

Some Upper Cretaceous Shells of the Rudistid group from Tamaulipas, Mexico. By L. W. Stephenson (Proc. U. S. Nat. Mus., Vol. 61, pp. 1–28, pls. 1–15, 1922). One new genus *Tampsia* and two new species, two new species of the genus Sanvagesia and one new species of the genus Durania are described and figured.

The European Pileworm, A Dangerous Marine Borer in Barnegat Bay, New Jersey. By T. C. Nelson (N. J. Agri. Exp. Sta., Circular 139, 1922). An interesting and pertinent paper on these destructive mollusks. There has been a constant loss from shipworms along the Atlantic coast for years, but apparently no unusual outbreak has occurred before. An investigation however is needed to enable us to realize present

conditions. A smaller pamphlet on "Destruction of Piling in Waterfront Structures: Its Prevention," published by the Committee on Marine Piling Investigations of the National Research Council, is also a timely paper on the subject.—C. W. J.

A Monograph of the American Shipworms. By Paul Bartsch (U. S. Nat. Mus., Bull. 122, pp. 1–51, pls. 1–37, 1922).

To the conchologists who trusted explicitly the works of Gould and Verrill the paper gives something of a jolt, when they find that three new species have been based on their so-called *Teredo navalis*. We have no reason to doubt that the author is right, for the paper shows a very careful piece of work and just as wonderful things have occurred before. In all some 14 new species are described and figured. The halftone figures of the shells do not show the sculpture in most cases, but this is described in the text. The "ravages by Gould shipworm at Port Tampa," as shown on plates 14 and 15 suggest that possibly the "gribble" (*Limnoria*) might also have aided in the destructive work.—C. W. J.

The Miocene of Northern Costa Rica. By A. A. Olsson (Bull. Amer. Paleontology, Vol. 9, pt. 2, Pelecypoda, pp. 171–309, pls. 16–32, June, 1922). About 70 new species and varieties are described and figured, in addition to 75 other species which are redescribed and figured. The work is a valuable addition to our knowledge of the miocene fauna of that region.—C. W. J.

The Story of Mollusks and of the Shells they live in. By Margaret G. Sherman (The Newark Museum Association, Newark, N. J., 1919). This is an original and very interesting little publication. The story when cut into paragraphs makes labels for 180 shells. A second edition, referred to as the "expanded pamphlet," have the paragraphs interlined in smaller type, with special description labels. For arranging a popular exhibit in museums and schools, this story would be very useful.—C. W. J.

VARIATION IN FRESH-WATER MUSSELS. By Gordon H. Ball (Ecology, Vol. 3, pp. 93–121, 1922). This very exhaustive paper on this interesting subject is based on the large collection in the Carnegie Museum. The variations are shown by plotting and tables, certain variations depending on various ecological conditions. Shells of smaller streams are usually less obese than those of the larger, although there are other factors that determine the degree of obesity. The development of the tubercles as a rule, is also greatest in the larger streams.—C. W. J.

VARIATION IN THE DOG WHELK, THAIS (PURPURA AUCT.) LAPILLUS. By Harold S. Colton (Ecology, Vol. 3, pp. 146–157, 1922). A study of the variation of the Dog Whelk, constitutes one of the most interesting features of collecting on the New England coast. Dr. Colton's work was confined to Mt. Desert Island, Me., and the immediate vicinity. Specimens from 106 stations seem to indicate that variation in size and shape of the shells is the result of the direct effect of environment, while variation in color and sculpture are due to hereditary factors. More light-colored shells are found on light than on dark environments. The imbricated form is generally associated with mud flats on the shores of Blue Hill Bay, while in exposed situations they are found only in fissures in the rocks. The almost complete absence of *imbricata* in Somes Sound is attributed to a change of sea level in recent times.—C. W. J.

THE AUCULOSAE OF THE ALABAMA RIVER DRAINAGE. By Calvin Goodrich (Univ, Mich. Mus. Zool., Misc. Pub. No. 7, pp. 1–57, pls. 1–3, 1922). This valuable paper is based on the collection made by the late Herbert H. Smith, between the years 1901 and 1918. After a year's examination of the collection the author feels toward Mr. Smith only the greatest respect for his industry in the field and the keenness of his observations. The Auculosae vary exceedingly, and the author refers to them as "an adaptive family that is constantly struggling with an altering environment." The introductory remarks on the group and its environment, opercula and classification are

very interesting. Of the 26 species described and figured, 11 that are new were described by Mr. Smith and one by the author.—C. W. J.

The Mollusca of Dickinson Co., Michigan. By H. B. Baker (Univ. Mich. Mus. Zool., Occasional Papers, No. 111, pp. 1–44, 1921). The habitat studies are very complete; all are numbered, and referred to by numbers in the list of species.

Notes on the Internal Lamellae of Carychium. By Mina L. Winslow (Univ. Mich. Mus. Zool., Occasional Papers, No. 128, pp. 1–16, pls. 1–5, 1922). An interesting study of the lamellae of these small shells, as an aid in determining closely related species.

Experiments in the Culture of Fresh-water Mussels. By Arthur D. Howard (Bull. Bureau Fisheries, Vol. 38, pp. 63–89, 1922). An interesting paper on mussel culture and conservation.

On the Nomenclature of certain North American Naiades. By A. E. Ortmann and Bryant Walker (Occas. Papers of the Mus. of Zool., Univ. of Michigan, No. 112). Much confusion still prevails in the nomenclature of our freshwater mussels. Mainly owing to the uncertainty attending many of Rafinesque's species and genera. Simpson brought some of them into use in his monumental Synopsis of the Naiades; but many more he ignored on account of the notorious obscurity of that author's writings. Subsequent writers have identified many additional Rafinesquian species and genera with varying degrees of certainty. The traditional identifications of some of Lamarck's species of *Unio* have been disputed. These and other cases requiring revision have been fully discussed by Ortmann and Walker in this paper of 75 pages. The paper was criticised in MS. by Pilsbry, whose decisions in cases not agreed upon were accepted. "As now issusd, the paper represents the unanimous opinion of all three of us on questions of nomenclature".

In an article so condensed, and dealing with so many points, it is quite impossible to give a summary. Those interested should obtain copies from the Museum of Zoology, University of Michigan.

The thorough acquaintance of both authors with the subject, their fair and comprehensive consideration of each case, with due reference to the International Rules of Nomenclature, should entitle their conclusions to general acceptance. It is to be hoped that this essay will tead to uniformity in matters of mere nomenclature, so that the energies of our Unio students can be more fully devoted to the many unsolved questions of structure, development and distribution of these most interesting mollusks.

NOTES.

NOTE ON ACMÆA PATINA *Esch.*—Eschscholtz in his Zoological Atlas described *Acmæa scutum* end *A. patina* on the same page and figured both, from Sitka. That the two are specifically identical was recognized by authors of the Carpenterian period, and *A. patina* was selected as the name to be used for the whole. Eschscholtz's figure of this is smaller that that of his *A. scutum*, though as large as many adults. That it is subspecifically distinct from *scutum* seems highly doubtful; I see no evidence whatever for that view. In cases of two names for the same species published at the same time, that selected by the first reviser has precedence, according to Art. 28 of the International Code. The species should therefore be called ACMÆA PATINA, *A. scutum* becoming a synonym.

The small race *A. patina fenestrata* ("Nutt." Reeve, 1885) has been mentioned as *cribraria* Gld. MS. by Carpenter, but *cribraria* was never defined, and the name did not appear in print until long after Reeve had figured *fenestrata*.—H. A. PILSBRY.

NOTE ON CYPRAEA PACIFICA OSTERGAARD.[1]—Upon a recent

[1] The name being preoccupied Dr. Dall has called this species *C. ostergaardi*. See NAUTILUS, Vol. 35, p. 50, 1921.—EDITORS.

trip to the Hawaiian Islands it was my pleasure to meet Dr. J. M. Ostergaard, eminent local biologist, and to inspect three of the type-lot of his Cypraea Pacifica. This species, although dredged in Honolulu Harbor in 1915, was not described until 1920 (NAUTILUS, XXXIII, p. 92). Only five examples were taken and no others have since been obtained. For purposes of reference, it should perhaps be known that one of these is in the collections of the American Academy of Sciences at Philadelphia, one in the Bishop Museum at Honolulu, one in my collection, and the other two in the collection of Dr. O.

This species is a distinct and interesting one, being of a uniform creamy-white color, with small brown dorsal spots; and it is noteworthy that in a community so long settled and "worked" by conchological collectors, both this beautiful novelty and also Mr. Melvill's pretty Cyp. Rashleighana should have escaped discovery until disclosed by dredging operations of recent years. —FRED L. BUTTON.

SUBSCRIBERS N. B.—A person once asked one of the editors if the Pearly Nautilus made a septum each year, and if it died when it ceased making septa. The only ready reply was—you will have to watch it and see. If the present volume (septum 36) of THE NAUTILUS failed to appear, you would certainly say it was dead. We do not know the age of a *Nautilus pompilius* L., or upon what it feeds, but we do know what THE NAUTILUS of Philadelphia and Boston requires. During the past few years the environment of the latter has greatly changed, and it now needs much more of its nutritious food—the "long green", than it used to. When the editors were younger, the little deficit each year was looked upon as a joke, but now the printer's bill reminds us of a huge *Tridacna* (with real teeth), and when it comes rolling in on the spring tides it is enough to crush the life out of any Nautilus—shell or paper. All that is needed now are a few more subscribers and the *prompt payment of subscriptions*, otherwise some day THE NAUTILUS will cease its wanderings over land and sea. Some one else may try again, but always remember what Horace Greeley said about starting a paper.—H. A. P. and C. W. J.

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THE ANATOMY AND TAXONOMY OF CERTAIN UNIONINAE AND ANODONTINAE FROM THE GULF DRAINAGE.

BY A. E. ORTMANN, PH. D.

The following notes are based largely upon the examination of material of fresh-water mussels, which the Carnegie Museum has received in part from G. H. Clapp, in part from the Alabama Museum of Natural History—it has been collected mostly by H. H. Smith and his assistants, but a few forms have been taken by myself in northern Georgia and Tennessee.

1. Fusconaia succissa (Lea) (1852).

See *Quadrula succissa*, Simpson, Descript. Catal. 1914, p. 867. There is no doubt that *Unio cacao* Lea is a synonym to this.

Choctawhatchee River, near mouth of Gittey's Mill Creek, Geneva Co., Ala. Two specimens (shells only), Victor Hutchinson coll.

Pea River (trib. to Choctawhatchee), Fleming's Mill, Dade Co., Ala. Eight specimens, shells and soft parts (6 males, 2 females), J. A. Burke coll., Nov., 1915.

Structure of the normal, primitive Unionine type. Supraanal opening present; it is slightly shorter than the anal, and separated from it by a well developed mantle-connection, which is shorter than the supraanal; in the largest male, however, the

connection apparently is torn. Anal opening with the inner edge finely crenulated, almost smooth. Branchial opening with strong papillae on inner edge. Palpi of the normal, subfalciform shape, their posterior margins connected for one-third to one-half of their length.

Gills normal; inner lamina of the inner gill free from abdominal sac, except at anterior end. In the female, all four gills are marsupial, with the septa more strongly developed and standing more closely than in the male.

Although the shape of the placentae and the glochidia are unknown, I have no doubt that this is a species of the genus *Fusconaia*, and not of *Quadrula*, for the reason that, in shell characters, it is extremely close to the *F. barnesiana*-group (see Naut. 31, 1917, pp. 58–64), and does not at all resemble the species of *Quadrula*, which all are more or less sculptured. *F. succissa* is very much like the headwaters-form of *barnesiana* (var. *bigbyensis* Lea), it differs, however, in the complete absence of rays, and the peculiar color of the nacre, which is highly iridescent and more or less purplish, often whitish toward the cavity of the shell, darker toward the margin. These tints are unknown in *F. barnesiana.*

The beak-sculpture of *F. succissa* is unknown, but the fact that even in the smallest specimens at hand, with the beaks very little eroded, no sculpture is seen, indicates that it must have been poorly developed, as is characteristic for *Fusconaia.*

In the two largest specimens (males) the gills had that characteristic blackish tint observed in *barnesiana;* for the rest, the soft parts were discolored by the action of the alcohol.

This species is known from the Choctawhatchee system in southern Alabama and western Florida. *F. barnesiana* and its varieties are from the Tennessee-Cumberland drainage; and the third species of this group, *F. ozarkensis* (Call), is from the Ozark Mountains; thus the distribution of the group is markedly discontinuous.

2. Megalonaias triumphans (Wright) (1898).

Quadrula triumphans Simpson, Descr. Cat., 1914, p. 823.

Coosa River, Wilsonville, Shelby Co., Ala. Five males,

eight females (soft parts only) and one shell, H. H. Smith coll., June 15, 1914.

Coosa River, Weduska Shoals, Shelby Co., Ala. Two shells, H. H. Smith coll., August, 1913.

Coosa River, Coosa Valley, St. Clair Co., Ala. One shell, H. H. Smith coll.

M. triumphans is the representative of *M. heros* Say in the Coosa River in Alabama, and it may run into *heros* in the Alabama River. At any rate, *heros* is known from Tombigbee River, as reported by Simpson, and confirmed by specimens in the Carnegie Museum (from McIntosh, Washington Co., Ala.). The differences between the two forms are very slight. *M. heros*, as a rule, has the posterior wing of the shell less developed and less elevated, and thus the shell appears more elongated, and the upper and lower margins are more nearly parallel; while *M. triumphans* has a more elevated posterior wing, rendering the shell higher and shorter in outline, with the upper and lower margins diverging.

As is to be expected, *triumphans* also belongs to the genus *Megalonaias*, created by Utterback for *heros* (Amer. Midl. Natural. 4, 1916, p. 41). The essential characters, both of shell and soft parts (as far as our material permits) are seen. Of course, no gravid females being at hand, the charged marsupium and the glochidium is unknown. It deserves special mention that connection of the inner lamina of the inner gill with the abdominal sac is well developed in all of my specimens, and mostly complete, only in a few there are short holes at the posterior end of the foot. In my barren females all four gills are marsupial. In the region of the anal opening all of my specimens are badly injured, and I have been unable to ascertain the presence of a supraanal opening.

3. Amblema perplicata elliotti (Lea) (1856).

Quadrula elliotti, Simpson, 1914, p. 819.

Othcalooga Creek, Calhoun, Gordon Co., Ga. (type locality). Two shells and soft parts of four males and three females, H. H. Smith coll., the former in July, 1914, the latter in July, 1911.

Conasauga River, Whitfield Co., Ga. Shells, H. H. Smith.

Coahulla Creek, Herndon's Mill, Whitfield Co., Ga. Shells, H. H. Smith.

Chattooga River, Cedar Bluff, Cherokee Co., Ala. Shells, H. H. Smith.

The anatomy agrees completely with that of *A. perplicata* (Conrad), as described previously (Ann. Carn. Mus. 8, 1912, p. 247, and NAUT. 28, 1914, p. 21); of course, the gravid condition of the female and the glochidium have not been observed.

Already Simpson is inclined to regard this as a form of *perplicata*, from which it is said to differ in the more decidedly quadrate outline (with the posterior margin almost squarely truncate) in the narrower anterior and higher posterior end (due to the better development of the posterior wing), and in the smaller and less elevated pseudo-cardinals. In my specimens of *elliotti*, I cannot discover any difference whatever in the hinge teeth; but the other characters are noticeable. However, such specimens are found practically all over the range of *perplicata*, from the Alabama system westward. I have material not only from the Coosa-Alabama Rivers, but also from Mississippi, Louisiana, Texas, Arkansas, Oklahoma, Kansas, Missouri and southern Illinois, and everywhere specimens of the *elliotti*-type may turn up. Simpson gives, for the latter, the range: "southern" (apparently misprint for "northern") "Georgia to Texas", but it seems to have a wider distribution, and moreover, the two forms insensibly run into each other. This is preëminently so in the Coosa River, from which I have a number of specimens labeled (by Walker) *perplicata*, which show all possible transitions toward *elliotti*. The latter form, indeed, seems to be, in the upper Coosa system, the prevailing form, and for this reason we should let it stand as a variety of *perplicata*, although elsewhere it is merely an individual variation of *perplicata*.

4. QUADRULA ASPERATA (Lea) (1861).

See *Quadrula pustulosa pernodosa* (Lea), Simpson, 1914, p. 851 (in part).

This is the shell, which represents, in the Alabama system,

the *Q. pustulosa* (Lea) of the interior basin. I have quite a number of specimens from the headwaters of the Coosa, down to Wetumpka, Elmore Co., Ala. In the Cahaba, Black Warrior, and Tombigbee drainages, similar, but somewhat different forms turn up; but I propose to restrict myself here to the Coosa-form.

Simpson has united this form with *Q. pustulosa pernodosa*, and Walker, who has identified part of the material at hand, has labeled it thus. However, the original *U. pernodosus* Lea does not come from the Alabama System, but is from "North Carolina", from rivers tributary to the Tennessee, and is nothing but an individual phase of the common *Q. pustulosa* (see Proc. Amer. Philosoph. Soc. 57, 1918, p. 540).

Simpson's diagnosis of *pernodosa* is entirely insufficient: "suborbicular, moderately inflated, pustulous; epidermis yellowish brown"; every word of this fits also the typical *pustulosa*. According to my observations, the Coosa-form is indeed different from the true *pustulosa*. But its chief characters are not found in shape or sculpture, for both are extremely variable, although, in the average, the Coosa-form is more rounded, that is to say, the posterior upper margin is not elevated, and does not form an angle with the posterior margin, but curves down into it very gently and gradually. But such specimens are not infrequent in the interior basin among *pustulosa*. The main difference of the two forms is in the color pattern. Typical *pustulosa* has rays, sometimes obliterated, it is true, in old specimens, but very generally present in younger and well preserved individuals; of these rays, chiefly one in the middle of the disk is noticeable, which is strongly developed, broad, often breaking up into a few large blotches. I have never seen this color pattern in the corresponding Coosa-form, but in its place there are concentric, narrow bands of blackish, dark green, or sometimes brownish color, following the growth rests. Sometimes these band are absent, but there are never rays here.

The name of *pernodosa* cannot be used for this Coosa-form; but there is no doubt that *U. asperatus* Lea stands for it. It originally comes from the Alabama River, Claiborne, Ala., and from the Coosa River, Ala. It should be known as *Quadrula*

asperata (Lea), and should rank as a *species*, since there are no transitional forms to *pustulosa* known to me, and since also the geographical distribution is different from that of the typical *Q. pustulosa*.

Q. asperata is very variable in the development of the tubercles of the disk. In young specimens they are generally absent, but begin to appear at a certain stage of the growth. Sometimes individuals turn up which have none or only few tubercles at a comparatively advanced age, and such specimens seem to be rather frequent in the headwaters of the Coosa, in northern Georgia. Walker has labeled them *Q. pustulosa kieneriana* (Lea). The same name he has given to the soft parts (without shells) of three specimens from Etowah River, Cartersville, Bartow Co., Ga. (H. H. Smith coll., October 1910). Of these, two were barren females, and in their anatomy they were identical with *Q. pustulosa*.

The question is, whether these specimens are the real *kieneriana*, which Simpson regards as a variety of *pustulosa*, with the diagnosis: "suborbicular, smooth or somewhat nodulous; epidermis ashy brown or greenish brown", and, according to the measurements given, it is smaller than *asperata*. According to this, shells with poorly developed tubercles should be called *kieneriana*, and Walker apparently has acted upon this principle. Yet I think that this is not correct, and that most of the specimens without nodules, or with only a few, chiefly those from the headwaters of the Coosa, are only individual variations of *Q. asperata*, for there is no other difference, and they insensibly pass into each other.

There is in the Coosa a closely allied form to *Q. asperata*, with the same concentric color-bands, which, however has the growth rests standing more closely, and has smaller tubercles. This may be the real *kieneriana*. But I am not in a position to affirm this positively, since my material is too meagre.

5. *Pleurobema georgianum* (Lea) (1841).
Pleurobema georgianum (Lea), Simpson, 1914, p. 792.
Pleurobema favosum (Lea) (1856), Simpson, ibid., p. 798.
Conasauga River, Conasauga, Polk Co., Tenn. Two males,

three gravid females with soft parts, A. E. Ortmann coll., May 24, 1915.

Conasauga River, Tennga, Murray Co., Ga. Two shells, H. H. Smith coll., Sept. 15, 1914.

Cowan Creek, Cherokee Co., Ala. One shell, H. H. Smith coll., Novemb. 1910.

Shoal Creek, St. Clair Co., Ala. One male and one female, soft parts only, H. H. Smith coll., Oct. 1914.

The three shells from Tennga, Cowan Creek, and the soft parts from Shoal Creek, were labeled by Walker *Pl. favosum.*

The type-locality of *U. georgianus* is: "Stump Creek, Georgia", which undoubtedly stands for Stamp Creek, near Cartersville, Bartow Co., Ga., in the drainage of Etowah River. No other locality, and only one specimen is known. *U. favosus* is founded upon a number of specimens from Othcalooga Creek, Gordon Co., Ga. (trib. to Oostanaula River, near Calhoun), and also in this case no additional exact localities are known, although Simpson gives: "Alabama system".

I do not entertain any doubt that *U. georgianus* and *favosus* are identical. They come from the same general region, and, according to the material at hand, this species has its home in the headwaters of the Coosa River in northeastern Alabama and northern Georgia. *U. georgianus* is founded upon a rather small specimen (L. 41 mm.), of normal shape, with yellowish brown epidermis, without rays or spots, while the figure of *U. favosus* represents a larger specimen (L. 52 mm.) of the same, regular shape, with the epidermis yellowish green or brownish, and with a row of green spots upon the posterior ridge. These spots, as far as I can see, are the only difference of the two "species", for the rest, they agree completely in color, outline and general shape, and also the diameter is about the same: 39 per cent of the length in *georgianus*, 38 per cent of the length in *favosus.*

My material shows conclusively that the color markings in this species are variable: in the set from Conasauga collected by myself, the epidermis is yellowish or brownish olive; the larger specimens are without spots, the smaller ones have more or less distinct spots on the posterior ridge, and in the smallest

they appear as an interrupted broad ray. In the other specimens, collected by Smith, the spots are rather distinct.

The shape of the shell is rather subovate, almost subelliptical in outline. In the larger specimens, however, the lower margin is not very convex, but in part more nearly straight. Very young specimens (from Tennga) are comparatively higher than old ones. In my specimens, the diameter varies from 33 per of the length to 41 per cent, the average being, in specimens from Conasauga, 36 percent, in the others about 39 per cent. The maximum size (male from Conasauga) is: L. 61, H. 40, D. 20 mm. (this is the most compressed individual, D. 33 per cent).

As we shall see below, this is a real *Pleurobema* according to the anatomy. It stands very close to the small-creek-form *Pl. oviforme argenteum* (Lea) of the upper Tennessee region (see: Proc. Amer. Philos. Soc. 57, 1918, p. 552), and the fact, that this latter form is found in tributaries of the Tennessee not far from the Coosa drainage (Chickamauga Creek in Catoosa Co., Ga., and Hiwassee drainage in Tennessee) suggests that there actually is genetic relationship between the two forms, and that *Pl. georgianum* reached the upper Coosa by crossing over the divide from the upper Tennessee (by stream piracy).

Pl. georgianum differs from *Pl. oviforme argenteum* only in the regular, suboval, almost subelliptical outline, while in the latter, the outline generally is subrhomboidal or subtrapezoidal, that is to say, there is a more or less distinct angle between the upper and the posterior margins. The compression of the two forms is nearly the same. In color pattern, they are also much alike, except that the spots, in *argenteum*, are often accompanied by more or less rays upon the disk. However, also in *argenteum*, rays and spots may be entirely absent.

The soft parts from Conasauga agree with those from Shoal Creek. The females of the former locality were gravid with glochidia (May 25). The anatomy is identical with that of *Pl. oviforme argenteum* (Naut. 34, 1921, p. 85). This concerns also color, the soft parts being either whitish or pale orange. The color of the marsupium (placentae) is cream or pale orange, exactly as in the *clava*-group of *Pleurobema* (to which *oviforme*

belongs). Glochidia of the usual shape, subelliptical, L. O. 13, H. O. 15 mm., and thus they are slightly smaller than those of the *clava*-group, and also a little higher in proportion to length, but in the latter respect, they agree with specimens of *argenteum* from Chickamauga Creek (see: Naut. l. c.).

6. *Pleurobema hagleri* (Frierson) (1900).

Simpson, 1914, p. 776.

North River, Hagler's Mill, Tuscaloosa Co., Ala. Two shells, H. H. Smith coll.

Valley Creek, Toadvine, Jefferson Co., Ala. Soft parts (without shells) of one male and one barren female, H. H. Smith coll.

Both localities are in the Black Warrior drainage, the first close to the type-locality (Tyner, Tuscaloosa Co.). The specimens have been identified by B. Walker.

Although no gravid females were at hand, the anatomy indicates that this species probably is a *Pleurobema*. The soft parts were discolored by the alcohol.

The affinities of this species are still obscure.

7. *Pleurobema patsaligense* Simpson (1900).

Simpson, 1914, p. 788.

Little Patsaliga Creek, Crenshaw Co., Ala. Two shells, topotypes, C. Goodrich don.

Sandy Creek, Evergreen, Conecuh Co., Ala. twelve shells, H. H. Smith coll.

Choctawatchee River, Blue Springs, Barbour Co., Ala. One shell, and soft parts of ten others (six males and four barren females), H. H. Smith coll.

The single shell from the Choctawhatchee is absolutely identical with the sets from the other two localities in the Escambia drainage, and thus it is shown that this species belongs to both systems.

Concerning the soft parts, the same is to be said as in the case of *Pl. hagleri*, and also its systematic affinities require further elucidation. It should be pointed out, that the shells of these two species (and of others from Alabama) show certain

similarities to the genus *Elliptio*: it is not impossible that we have here the intergrading forms between *Elliptio* and *Pleurobema*.

8. *Pleurobema modicum* (Lea) (1857).

Pl. striatum (Lea) (1840), *Pl. modicum* (Lea) (1857), *Pl. amabile* (Lea) (1865), see: Simpson, 1914 p. 794, 795.

All three forms are from the Appalachicola system, the first two from the Chattahootchee River, Columbus, Ga., the last from the upper Flint drainage at Butler, Taylor Co., Ga. I have the following material:

Chattahoochee River, Ga. Two shells, Hartman collection (labeled *striatus*).

Pea River, Fleming's Mill, Dade Co., Ala. Eleven shells, ten of these with soft parts (five males, five barren females), J. A. Burke coll., Nov., 1915 (marked "Pea R., no. 2").

Choctawhatchee River, Blue Springs, Barbour Co., Ala. Soft parts (without shells) of seven males and five barren females, H. H. Smith coll., Oct., 1915 (marked "Choct. R., no. 6, same as Pea R., no. 2").

According to the published descriptions and figures, the diferences of these supposed three species may be tabulated as follows:

a_1 Nacre flesh color to purplish. Posterior point of shell near base and lower margin of shell nearly straight.

$_1$ Shell rather compressed, Dia. 33 to 36 per cent of length. *striatum.*

b_2 Shell more swollen. Dia. 42 to 45 per cent of length. *modicum.*

a_2 Nacre whitish or yellowish. Posterior point of shell more elevated above base and lower margin more convex. Shell rather swollen. Dia. 41 to 43 per cent of length. *amabile.*

The position of the posterior point of the shell is very variable and unfit to serve as diagnostic character. My two shells from Chattahootchee River, labeled *striatus*, possess the dia. of 40 and 41 per cent, and thus connect *striatum* and *modicum* more closely; I think that there is no doubt that these two are actu-

ally identical. Since Walker has shown (Univ. Mich. Miscell. Publ. 6, 1918, p. 183) that *U. striatus* Lea (1840) is preoccupied by *Unio striatus* Goldfuss (1839), *U. modicus* becomes the oldest available name. (*Pl. simpsoni* Vanatta, Pr. Acad. Philad. 1915, p. 559, introduced on account of *Obovaria striata* Rafinesque [1820] is unnecessary.)

My set of shells from the Choctawhatchee drainage (Pea R.) agrees in every particular with *amabile*, except that the shells are slightly less swollen (dia. 37 to 43 per cent, average 38 per cent), thus approaching the *striatum*-type. Thus there remains only one distinguishing character from the Chattahootchee shells, color of nacre. But since the whitish color (*amabile*-type) is also originally from the Chattahoochee drainage, it is safe to place also *amabile* in the synonymy of *modicum*.

In my specimens from Pea River the epidermis is, in the younger ones, tawny or greenish brown, sometimes obscurely rayed. In older ones it is darker, brownish, shading to blackish toward the beaks. Nacre whitish, often stained yellowish in the beak cavity.

According to the soft parts, this seems to be a *Pleurobema*, possessing the structure of this genus, as far as we can judge in the absence of gravid females. But its position within the genus is not yet clear. It is a small species, so far restricted to the Appalachicola and Choctawhatchee systems in S. W. Georgia, S. E. Alabama and probably also West Florida.

9. Lasmigona (Alasminota) holstonia (Lea) (1839).

Alasmidonta holstonia (Lea) and *Al. georgiana* (Lea), Simpson, 1914 pp. 502, 503.

See also: *L.* (*Sulcularia*) *badia* (Raf.), Ortmann, Nautilus Proc. Amer. Philos. Soc. 57, 1918 p. 557; *L.* (*Alasminota*) *holstonia*, Ortmann, Naut. 28, 1914 p. 43, and 34, 1921 p. 87.

This species, common in small streams in the upper Tennessee, has also been reported from the headwaters of the Coosa River, and undoubtedly is present there. This fact again indicates a close connection of the upper Coosa drainage with that of the upper Tennessee. According to material before me, it is widely distributed also in the Coosa drainage, from northern

Georgia down to Talladega and Shelby Cos. in Alabama, and also here it avoids the larger rivers, preferring smaller streams. It should be pointed out that the two ranges are in close contact, since, in the Tennessee drainage, this species is known from South Chickamauga Creek in Catoosa Co., Ga., and from the Hiwassee drainage in Polk Co., Tenn.

I have examined specimens with soft parts from the following localities in the Coosa drainage.

Chattooga River, Trion, Chattooga Co., Ga. Three males and two females. A. E. Ortman coll., May 19, 1915.

Little River (trib. to Chattooga), Cherokee Co., Ala. One male and one female (without shells). H. H. Smith coll.

The structure of these is entirely normal, as described previously.

(To be continued)

PROSERPINIDAE.

BY H. BURRINGTON BAKER.

Proserpina Gray (1840). Nude name.

Odontostoma d'Orbigny (1841), not Turton (1829), etc., etc. Type *O. depressa* d'Orbigny (1841), Cuba.

Proserpina "Gray" Sowerby (1842). Type (monotype) *P. nitida* "Gray" Sowerby (1842), Jamaica, Not *Proserpinus* Hübner (1816), Lepidoptera (Verz. bek. Schmet., p. 132).

Ceres Gray (1856). Type *Carocolla eolina* Duclos (1834), Vera Cruz, Mexico.

Proserpinella Bland (1865). Type (monotype) *P. berendti* Bland (1865), Mirador, Mexico.

Cyane H. Adams (1870). Type (monotype) *C. blandiana* H. Adams (1870), Eastern Peru.

Linidiella Jousseaume (1889). Type *Proserpina swifti* Bland (1863), Puerto Cabello, Venezuela.

Despœna R. B. Newton (1891). Substitute for Proserpina; same type.

Chersodespæna Sykes (1901). Type *Despœna cinnamomea* Sykes (1901), between Ayabamba and Santa Rosa, Ecuador.

Staffola Dall (1905). Type *Proserpina derbyi* Dall (1905), subfossil, Rio Chico, Paraguassu, Bahia, Brazil.

A. Shell large, heavy, carinate; externally with riblets above and thickened below. Columellar, parietal and palatal lamella (Mexico). Genus *Ceres.*

A'. Shell smaller, thin, rounded; without definite riblets. Genus *Proserpina.*

B. With distinct, thin, columellar lamella. Subgenus *Proserpina* s. s.

C. Palatal, parietal and columellar lamellæ (Antilles). Section *Proserpina* s. s. (+*Despoena*).

C'. Parietal and columellar lamellæ (Antilles). Section *Despænella* new name (+*Odontostoma*).

C''. Columellar lamella only (Venezuela to Ecuador). Section *Linidiella* (+*Chersodespæna*).

B'. With heavy columellar lamella, appearing as truncation of columellar pillar (South America). Subgenus *Cyane.*

D. Parietal lamella also present (Brazil). Section *Staffola.*

D'. Columellar truncation only (Peru, Bolivia). Section *Cyane* s. s.

B''. Parietal lamella only (Mexico). Subgenus *Proserpinella.*

As will be seen from the above, even if it were decided that *Proserpinus* preoccupied *Proserpina* (Cf. Newton and also Sykes, l. c.), *Despœna* (Despœnidæ) could not be used as a generic term without designation of considerably smaller generic limits than here recognized. Regardless of the size of the genera, *Proserpinellidæ* would become the only appropriate family name.

A CRITIQUE ON PROFESSOR HAROLD HEATH'S CHIORÆRA DALLI, WITH SPECIAL REFERENCE TO THE USE OF THE FOOT IN THE NUDIBRANCHIATE MOLLUSK, MELIBE LEONINA GOULD.

BY H. H. VON WOLD KJERSCHOW AGERSBORG.

(From the Zoological Laboratory, University of Illinois, with Plates II to V.)

The remarkable Nudibranch *Melibe leonina* Gould has recently been described by Professor Chas. H. O'Donoghue, from the Vancouver Island region, under the nomenclature of Gould (1852), the discoverer of the species. Heath (1917) also employs Gould's nomenclature for the genus, but he goes farther than O'Donoghue by naming for it a new species, *Chioræra dalli.* Heath's species was collected off the coast of British Columbia. That is, not far from O'Donoghue's territory, nor, indeed, from that of Gould. The specific description of Heath, as far as it goes, coincides perfectly with that of Gould (1852), Cooper (1863), Fewkes (1889), Bergh (1904), O'Donoghue (1921) and Agersborg (1916, 1919, 1921, 1921*a*, 1922). The only difference lies in his statements in regard to the salivary glands and the tentacles. Microscopic sections of the anterior end of the alimentary canal of Heath's species no doubt will reveal these glands just as in the case of the type species of Gould. These glands, as I have shown before (1922), are very small, and are imbedded in the connective and muscular tissues of the neck, opening into the alimentary tract by minute crypts through the entoderm between the proventriculus and the mouth. Heath does not seem to appreciate Gould's description neither in the Latin nor in the English. It is, therefore, no wonder that Heath makes a new species of Gould's *Melibe leonina.*

Gould's description reads:

"Body limaciform, smooth and of a pearly and whitish colour, finely reticulate with orange. The head is enormously enlarged, with a distinct neck, semiglobose, the oral face flattened. The oral fissure is longitudinal, the lips large, with the true mouth within at the posterior portion; around the edge of the oral disc or cowl is a double series of orange-coloured cirrhi,

each of which has an independent motion. On the top of the head are two foliate expansions, destitute of venations, which answer to the true tentacles; on their anterior edge is an opaque whitish papilla, presenting something of a spiral or lamellar structure; they were sometimes wholly retracted within a permanent sheath." P. 310.

Heath's description reads in part:

"*External Features.*—The body (Pl. XI, fig. 1) comprises two distinct divisions, the head and the body proper. The head presents the appearance of a low vault or cowl provided with two dorsal tentacles, two sets of marginal tentacles and on its under surface bears the mouth. Unlike *Chiorœra leonina*, the dorsal tentacles are not retractile, and in preserved material are plain, muscular, foliaceous outgrowth. Gould states that the tentacles of *C. leonina* bear on their anterior margins 'an opaque, whitish papilla, presenting something of a spiral or lamellar structure.' Nothing of the kind has been found to exist in the present species.

"The marginal head tentacles form two series, an outer set comprising from fifty to seventy-five large, slender processes, and an inner fringe formed of much smaller outgrowths of approximately double the number. Each of these cirri is provided with a nerve (Pl. XI, fig. 2) and gives evidence of being a tactile organ, though observations along this line were very incomplete.

"The mouth presents the appearance of a longitudinal slit (Pl. XI, fig. 1) placed near the posterior margin of the head, and therefore in close proximity to the anterior margin of the foot. Its posterior border may be said to be formed by the free border of the head, which here forms a deep angle usually devoid of the larger type of tentacle." P. 138.

"*Chiorœra dalli* new species.

"Body limaciform, smooth and of a pearly color without definite signs of pigmentation. Head enormously developed, with the mouth near the posterior margin. Dorsal tentacles simple leaf-like expansions without special sheath. Jaws, Radula, and salivary glands wanting." P. 147.

From the above, it is seen the two descriptions agree exactly. The differences which Heath tries to bring out, are based on his failure to understand Gould's description, and also, judging from his own statement, he evidently made very superficial observations of the living animals. In preserved specimens, the whitish papilla is always retracted within a permanent

sheath; it is very hard to see in preserved specimens. In living animals, it seems to be very sensitive, although not so sensitive as the oral cirrhi, and, at the least disturbance, it is quickly withdrawn within the tentacular sheath, or stalk. Heath confuses the tentacular papilla, that is the true tentacle, with the foliaceous tentacular stalk. The tentacular stalk is never retracted. And, it was neither claimed by Gould. When this last named author writes: "*Tentaculae cephalicae foliatae, retractiles;*" he means exactly what he says on the same in English: On the top of the head are two foliate expansions, . . . ; on their anterior edge is an opaque, whitish papilla, presenting something of a spiral or lamellar structure; they were sometimes wholly retracted within a permanent sheath." It is clearly indicated by Gould's description that when he speaks of tentacles he includes the opaque, whitish, foliate papillae (one on each tentacle). That is, his "tentacle" stands for a whole; a part of a whole may be retracted within a whole, but the whole may not be retracted within a part of itself. The papilla stands for a part of the tentacle; the tentacle consists of the papilla and the foliate expansion. And, as I have stated above, the true, or real sensory organ, as far as the tentacle is concerned, is the papilla, which, *ipso facto*, is the actual tentacle, or the "rhinophore" of many writers, (*vide*: Agersborg, 1922). The rest of the tentacle, that is, the foliate expansions, is the tentacular sheath. It is only fair to Heath, to state here that the *papilla*, at times, may fall off from the stalk, since it is quite constricted at its base (Figs. 4, 5), but in a large number of specimens as examined by Heath, this should not be the general case. If an entire tentacle is stained in borax carmine, the papilla — completely retracted within the foliate expansion—will stain more deeply than the remainder. This is illustrated in Pl. IV, figure 6. In specimens preserved in alcohol or formaldehyde, the papilla may be overlooked easily. In point of fact, O'Donoghue (1921) claims no "rhinophores," p. 192, for *Chioræra leonina*. This shows that the "papilla" is quite difficult to see. On page 193 he writes: "No structures comparable with the rhinophores of other nudibranches could be found unless the cephalic appen-

dages are their modified representative, which hardly seem probable." This, of course, is an error, and represents a good proof that the living animals, also in this case, were not studied carefully. As stated above, the sensory part of the tentacles is always retracted when the animal is disturbed, and may only be seen when the animal is left at rest in the aquarium. Then, it may become quite conspicuous (Pl. IV fig. 5*a*, *pa.*). O'Donoghue's statement, therefore, in regard to the absence of "rhinophores," indirectly substantiates my claims that Heath is wrong. With these things in mind, it is perfectly evident that Heath's description, as far as quoted, is a duplicate of Gould's. The rest of Heath's paper, as far as accuracy goes, is very similar to the part thus far reviewed. It is not my purpose to go into details here. I only wish to point out some of the main features. Heath's drawings are exceedingly unreliable as they are too diagrammatic (Fig. 6) and do not tally with his text. It is much to be regretted that Heath did not consult the literature. That would have saved him from creating a new species. In this case, there is no new species at all! (*Vide* literature on Nudibranches in general, and *Tethymelibidae* in particular: Agersborg 1916, 1919, 1921, 1921*a*, 1922). As regards Heath's drawings, it is only necessary to refer to his drawing of the tentacles which are represented by a *mere line!* Since the tentacles form one of Heath's basic reasons for creating a new species out of Gould's *Melibe leonina*, they should have been represented by very accurate drawings. That Heath's drawings of the tentacles are both incomplete and inaccurate, are supported by examination of preserved specimens from the vicinity of Heath's type locality. The structural features, as pointed out by Heath, in which his *Chioræra dalli* differs from Gould's *Melibe leonina*, are altogether too trivial, and his drawings too poor (Fig. 6), that I do not think anyone who knows Gould's species can possibly accept the species of Heath. The status of the genus itself is for the first time, to my knowledge, properly set forth by myself (Agersborg, 1921*a*). In this paper, the reasons are given why Gould's *Chioræra* is a synonym of *Melibe* Rang (1829). Several authors, moreover, although without giving a reason, recognize *Chioræra* as a synonym of *Melibe*.

(*Vide*: Tryon, Jr. 1883, p. 382; Fischer 1887, pp. 533–534; Bergh 1892, pp. 1039–1043; 1904, p. 13; 1907–1908, pp. 95–98). O'Donoghue (1921) although he classified *Melibe* under the nomenclature of Gould, states later in a letter to me: "I have quite given up *Chioræra* as a name." This, I am sure, will be the conclusion of every student who studies this subject seriously. In creating a new species, I think, Heath violated good usage among investigators by not familiarizing himself with the literature on the subject with which he dealt.

The species *Melibe leonina* Gould was quite fully described by me in an unpublished Master's thesis (1916), which is in the Library of the University of Washington, Seattle. It is not expected that Heath should know anything about this, but it goes without saying, that students of Zoölogy, nowadays, must consult the literature when they write for publications, lest their contributions to the science may be little less than a stumbling block for subsequent workers.

Heath's record of the swimming habit coincides with Gould's, also with mine (1916, 1919, 1921, 1921*a*, 1922, 1922*a*, 1922*b*). His description of the contents of the stomach and intestines differ. In my specimens, the alimentary tract contained crustaceans of various kinds, and of different sizes (Pl. V, figs. 7, 8, cr.). The food of *Melibe leonina* is crustaceous *per se*. (*vide litteraturae supra et infra*). *Melibe*, however, as I have pointed out elsewhere (1922*b*), is not such an able swimmer as *e. g.*, *Dendronotus giganteus* O'Donoghue.

Heath's reference to egg-bodies or nidosomes by the statement: "Large numbers of eggs were found attached to 'eel grass' and imbedded in gelatinous, spirally-wound folds after the fashion of many nudibranchs," does not agree at all with the nidosome of the Puget Sound species (Pl. II, fig. 2), whose egg-body (*vide:* Agersborg, 1916, 1919, 1921) consists of a broad ribbon (*not* "spirally-wound folds") which folds into a funnel-shaped form when supported in the water owing to one side of the ribbon being shorter than the other, and the shorter side becomes attached to the eel-grass. Heath's "spirally-wound folds" fit better to the nidosome of the "Sea-lemon," *Anisodoris* Bergh (*Anisodoris nobilis* MacFarland), (Pl. II,

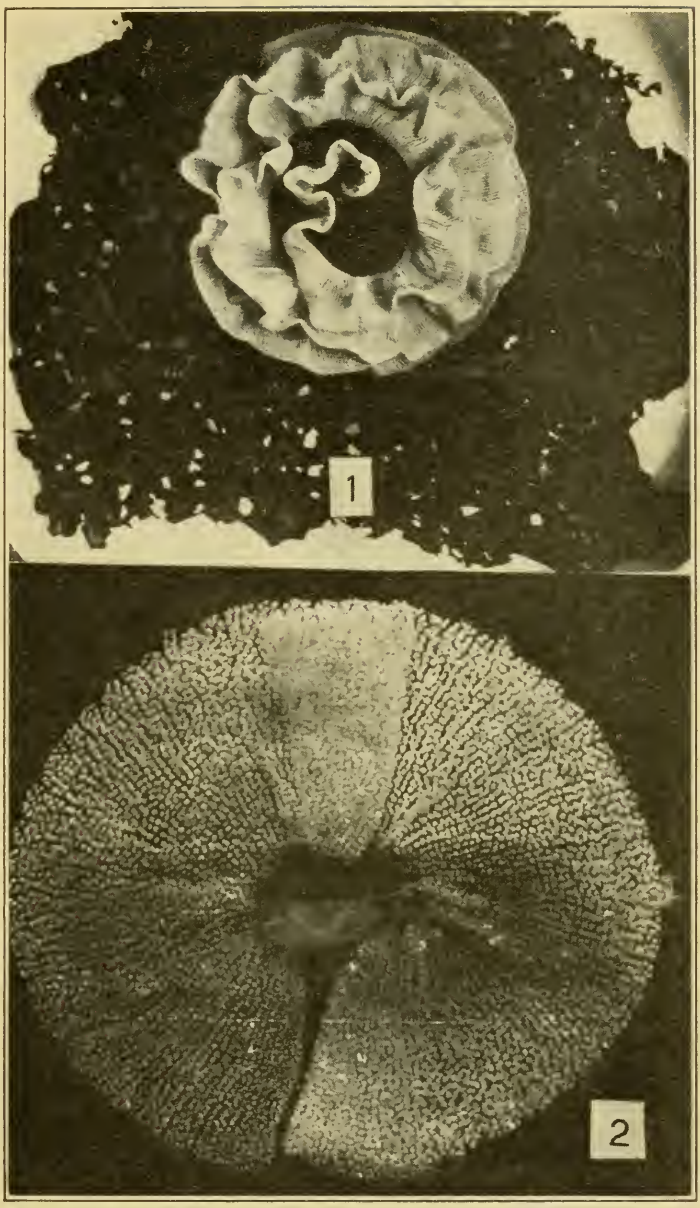

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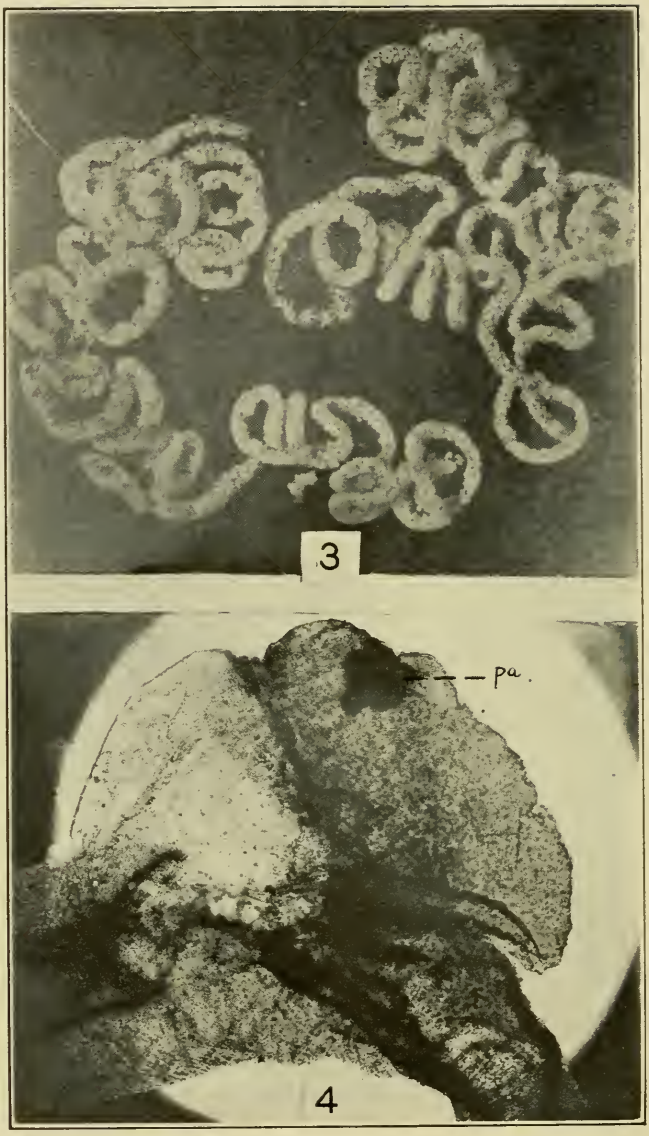
Fig. 1. Nidosome of *Anisodoris nobilis* deposited on sea-lettuce (*Ulva lactuca*). Photo. by Dr. Sidney E. Johnson.

Fig. 2. Nidosome of *Melibe leonina* deposited on *Zostera marina*. Photo. by author.



KJERSCHOW AGERSBORG: MELIBE LEONINA ETC.

Fig. 3. Nidosome of *Dendronotus giganteus*. Photo. by author.

Fig. 4. Dorsal tentacle from preserved specimen of *Melibe leonina* showing contracted papilla (*pa*) of Gould, stained with borax carmine, mounted in canada balsam. Photo. by author.

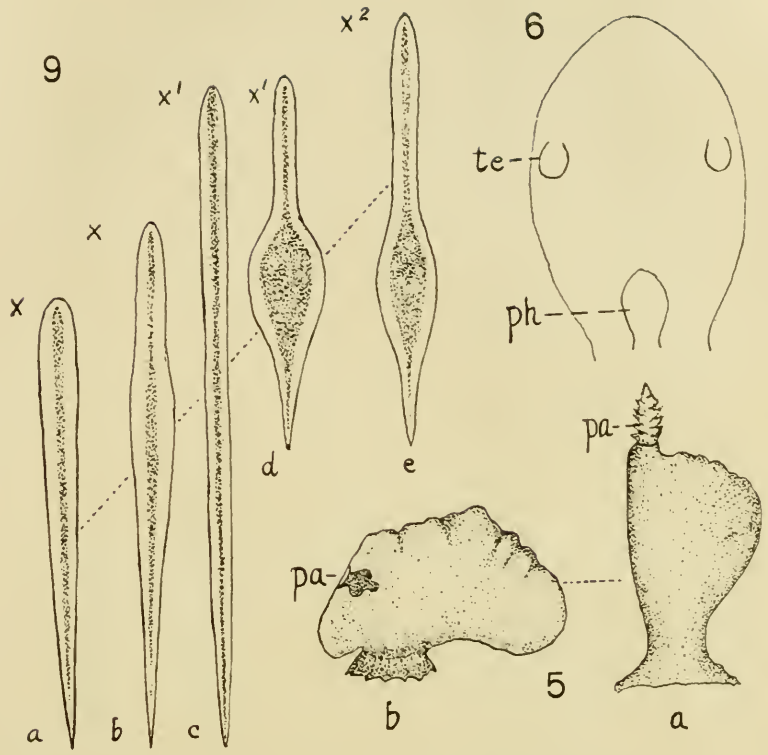


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Fig. 5 a. Drawing of dorsal tentacle of *M. leonina* from life, showing the papilla (*pa*) of Gould. b. The same from preserved specimen, seen with the unaided eye.

Fig. 6. Copy of Heath's drawing (pl. 12, f. 6) of the hood of "*Chiorrera dalli*", (= *Melibe leonina*). *te*, tentacle (dorsal tentacle). *ph*, pharynx.

Fig. 9. Diagrams illustrating various aspects of the foot of *M. leonina* during "galloping". *a*, normal; *b*, beginning (x) of elongation of the foot; *c*, maximum elongation, x advanced to x^1; *d*, x^1 adheres to substrate, large monotaxic pedal wave passes from anterior to posterior, and posterior end of foot is drawn anteriorly producing at the same time a large swelling on the middle of the body and foot. *e*, second elongation, a new wave sets in from anterior to posterior, repeating the same phenomenon as in *b*, x.

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Fig 7. Microphotograph of a cross-section of the gizzard of *Melibe leonina*; *cr*, sections of crustaceans filling the stomach.

Fig. 8. Microphotograph of the cross-section of the intestine, *cr*., egg-pouches with embryos of crustaceans.

fig. 1). There can be no doubt as to the nature of the nidosome of *Melibe leonina*, as this species deposited two nidosomes in the laboratory during the summer of 1914 (*vide:* Agersborg, 1916, 1919, 1921); these were used as a check for those found in nature at that time, *e. g.*, on the eel-grass (*Zostera marina*), where *Melibe* also were collected. The same kind of nidosomes had been found before by members of the Puget Sound Biological Station, but it was not known to what species it belonged until *Melibe leonina* was seen to deposit the same kind in the laboratory. Closely related species among the *Aeolidia* deposit nidosomes of great similarity: *Aeolidia coronata*, *Hermissenda opalescens*, *Coryphella longicaudata*, etc. (Fig. 3). The extent of the spiral form of a nidosome of this kind depends on two things: (1) on the speed of the egg-mucus flow, and (2) on the speed with which the nudibranch moves during oviposition (Agersborg, 1922*c*). In the light of these facts, I am compelled to doubt, therefore, very much whether Heath's statement in regard to the nidosome of his species is any more valid than his supposed new species. Of course, Heath's inference is only a guess. I have suggested above the only scientific way to identify nidosomes.

O'Donoghue (1921) makes the following statement in regard to *Melibe leonina:*

"There seems little doubt that this species is mainly pelagic for it is found floating freely in the sea during the early months of the year and I have seen it at the end of July and the middle of August. Towards the middle or end of May, however, it comes in to spawn and it is then very plentiful. . . . At this time, the animal is present in hundreds and so constitutes an extremely common form at these two points (on the Zostera beds at the Station and at Mudge Island). Even then, however, it does not creep about on the eel grass but only seems to adhere for the purpose of laying its eggs. In the laboratory too it does not creep on the sides of the aquaria and only rarely clings to them. It has not been observed creeping on anything after the manner of other Nudibranchs and if not entirely a pelagic form like *Phyllirhoe* it is beyond doubt very nearly so and is a most interesting form." P. 194.

Inability to use foot for the purpose of locomotion on the substratum as suggested by O'Donoghue does not hold. *Melibe leonina* though pelagic *at times* is quite able, as we will see, to use the foot in locomotion by the means of creeping. Professor Trevor Kincaid kindly informs me that in the summer of 1917 he found one of the bays of Hoods Canal literally filled with this species—there were an incredible number—"millions of them." The piles under the docks were covered with them.

(I am under the impression that Professor Kincaid also stated that *Melibe* was clinging to the piles above low-water mark at low tide; if this be the case, it is the first time on record that this species has been seen alive on dry land; it will be noted, that the body of *Melibe leonina* is so soft and watery that it loses very soon its fluid-contents when left out of water. This is at least true when the animal is lifted out of water and examined on a glass plate). From the same source, I have the corroboration on the point in regard to locomotion: *Melibe leonina* is perfectly able to creep on a solid substratum. I am very much indebted to Professor Kincaid for this point of information, not only because of the unusual nature, *e. g.*, as regards the occurrence of *Melibe* on the piles above low-water mark, and the great abundance in which it appeared; but also, for his statement in regard to the locomotion of *Melibe leonina*.

M. leonina, then, uses its foot for creeping purposes! As shown elsewhere, (Agersborg 1919, 1921, 1922, 1922b) the foot is highly ciliated, and the ciliated ectoderm is innervated with nerve fibres from the nerve-net which is spread throughout the foot. During the summer (1921) while working experimentally on the chemical sense of *M. leonina* (Agersborg 1922a). I had the opportunity to study this species very closely. As stated above, its food consists of small crustaceans of various kinds: copepods, isopods, amphipods, etc., judging from the contents of the alimentary tract (Pl. V, figs. 7. 8). In the laboratory, I fed it on *Caprella* and *Gammarus*, about 20 to 15 mm., long, respectively. The former, although it fastened its claws into the membrane of the mouth of *Melibe*, was nevertheless pushed down into the oesophagus, proventriculus, gizzard, etc. of *Melibe*. The latter was executed in the same way. I

also succeeded in feeding it on the muscles of *Cucumaria japonica* Semper. The muscle, however, passed apparently unchanged through the digestive tract and appeared at the anus 36 hours later.

During the study of the pedal locomotion, I again observed its mode of swimming, (*vide*: Agersborg 1916, 1919, 1921, 1922). I have at this time to correct a mistake which appears in my paper (1921) relative to the mode of swimming of *Melibe leonina*. In the Summary, paragraph 3, line 1, it should read according to the MS. and the proofs: "*It swims freely in the water, back upward, or downward.*" Instead of: "It swims freely in the water, backward, upward or downward." The word "*backward*" is wrong. *This change was not authorized by the author!* It introduces an idea which is contrary to facts. Whether an addendum, pointing out this erratum, will appear in the journal in question, I am unable to say. For anyone who may be interested in this subject, I have made the corrections here. Although O'Donoghue thinks *Melibe* is mainly pelagic, it is quite evident, judging from its habitat, that the pelagic habit is periodic at the most, i. e., its recurrence is spasmodic, as I have pointed out before (1916, 1919, 1922*b*). *M. leonina* does not only occur as a pelagic form (1922*d*), but may be found at considerable depths which is perhaps its habitat the greater part of the year. Gould's specimen, 133 mm. long, 17 mm, high, and 32 mm. wide, was dredged at about 5½ meters depth; Cooper's (1963) 70 mm. long, and 17 mm. high, at a depth of 38 meters. Presumably, when it is at the bottom, it crawls *on the bottom* for it has a well developed foot not only for clinging on to sea-weeds but also for actual creeping and, indeed, for "galloping" to use a term employed by previous writers for other forms.

On one occasion as I was trying to feed *Melibe leonina*, it dropped to the bottom of the aquarium and commenced *gliding* along it. I continued the feeding experiment when to my astonishment this nudibranch, *Melibe leonina*, suddenly elongated to nearly twice its normal length, and then shortened to less than half its normal length, showing a method of creeping similar to that described by Parker (1917) for the seahare,

Aplysia californica Cooper (Pl. IV, fig. 9). When elongating the body, the anterior one third of the foot was lifted above the substratum and then let down; the posterior one third then passed toward the middle of the body which became much wider at the base and along the sides, and then the forward stretching was repeated. This sort of creeping was accomplished by a large muscular wave which passed from the anterior to the posterior, that is, by direct monotaxic waves. In ordinary locomotion (creeping) the cilia of the foot may play an important part because the locomotor waves are almost indiscernible.

This adds one more mollusk to the number recorded by Parker (*vide:* literature, Agersborg, 1922*b*) in which locomotion is effected by rhythmic pedal waves.

Summary.

1. *Melibe leonina* has been found at depths from about 2 meters to about 38 meters; it is littoral; it is pelagic. Its pelagic habit seems to be periodical; it is not pelagic all the year.

2. It swims freely in the water, the back downward or upward.

3. It creeps on the surface film by ciliary action of its highly developed foot.

4. It may remain above low-water mark during low tide (but in shaded places); in one such instance it was found to cover the piles under the dock in one of the bays of Hood's Canal, Washington. Literally millions occurred at this time in this particular bay.

5. It may creep, when disturbed, by producing large direct monotaxic pedal waves, two in number being on the foot at the same time.

6. The cephalic tentacles of *Melibe leonina* (s. *Chioræra* Gould) are highly developed organs (*vide:* Agersborg, 1922, 1922*a*); the sensitive part is represented by a foliate papilla (Gould) situated at the anterior margin and is readily retracted within the tentacular stalks which form a permanent sheath for the papillary organ. This papilla has been called the "rhino-

phore;'' whether it be an organ of olfaction or not, it is highly innervated with nerve fibres throughout (*vide:* Agersborg, 1922*a*).

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NOTES ON THE NAIAD FAUNA OF THE UPPER MISSISSIPPI RIVER. *

II. The Naiades of the Upper Mississippi Drainage.†

BY N. M. GRIER AND J. F. MUELLER.

(Continued from page 49.)

23. *Pleurobema pyramidatum* (Lam.)=*Q. pyramidatum* (Lam.) Simpson—north in the Mississippi to Prairie du Chien, Wisconsin. We collected specimens of it in L. Pepin.

24. *Pleurobema clava* (Lam.).

Simpson's records of this species from Minnesota and Iowa are considered doubtful (see Ortmann, 1). It may be present nearer the Ohio. Probably of a tributary type.

25. *Elliptio crassidens* (Lam.)=*Unio crassidens* (Lam.).

Reported by Holzinger (7) from Winona County, Minn.

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†Contribution from U. S. Biological Station, Fairport, Iowa, and Biological Laboratory Washington and Jefferson College.

We also found this species at Red Wing, nearly 80 miles above this point. Absent from L. Pepin; more abundant above that point. Not common.

26. *Elliptio dilatatus* (Raf.)=*Unio gibbosus* (Barnes).

Simpson—entire Mississippi drainage. Apparently clammed out in the vicinity of Red Wing, but abundant in L. Pepin, decreasing in numbers descending the river. Not reported from N. and C. Minnesota.

Sub-Family ANODONTINAE.

27. *Arcidens confragosus* (Say).

Simpson—Mississippi river and states adjoining it. Reported from Iowa by Baker (1); S. Minnesota by Grant (6). Collected by us near Red Wing. Comparatively rare.

28. *Lasmigona compressa* (Lea)=*Symphynota compressa* (Lea).

Simpson—E. Iowa and Wisconsin. Wilson and Danglade, Mississippi R. above Bemidji and Bemidgi Lake. We did not observe it between Red Wing and La Moille, Minn.

29. *Lasmigona costata* (Raf.)=*S. costata* (Raf.)

Simpson—Upper Mississippi drainage, and St. Lawrence. Wilson and Danglade, Red River of the North. Rare. We secured specimens of this only above L. Pepin.

30. *Lasmigona complanata* (Barnes)=*S. complanata* (Barnes).

Simpson—Upper Mississippi drainage, St. Lawrence. Wilson and Danglade(18), Crow Wing drainage, Minn. Common. A var. *katharinae* (Simpson) is found in the Red River of this North, it may be later found in the Upper Mississippi, although it has not been reported from there as yet.

31. *Anodonta imbecillis* (Say).

Wilson and Danglade (18), L. Minnewaska, Minn. Simpson —entire Mississippi drainage area.

32. *Anodonta grandis* (Say).

Simpson—entire Mississippi River system. By some, it is believed to be a tributary form rarely found in the river. It is often confused with *corpulenta*, Call insisting they are the same species. Var. *benedictensis* (Lea) reported by Wilson and Dan-

glade from L. Minnewaska; var. *gigantea* (Lea) reported by Call; var. *pepiniana* (Lea) reported by Wilson and Danglade from lakes of Crow Wing drainage, Minn. var. *kennicotti* (Lea) by the latter from L. Osakis are all considered by Ortmann as doubtful forms.

33. *Anodonta corpulenta* (Cooper).

Simpson—Upper Mississippi drainage. Wilson and Danglade, St. Croix drainage. In our experience somewhat more abundant than *grandis*.

34. *Anodonta suborbiculata* (Say).

Simpson—Iowa, Illinois and South. Rare in the main river, but somewhat fairly common in the sloughs, especially at Fairport, Iowa.

35. *Anodontoides ferussacianus* (Lea).

Simpson—Upper Mississippi drainage area generally, but as Ortmann, (10) points out its range is more northern. The variety *buchanensis* (Lea) appears to be an old female of *ferussacianus*. It has been reported from the Red River of the North and Crow Wing drainage by Wilson and Danglade. *A. modestus*, reported by the latter from the lakes of the Minnesota River drainage is thought by Ortmann to be a dwarf form of *A. ferussacianus*.

36. *Simpsoniconcha ambigua* (Say)=*Hemilastina ambigua* (Say).

The U. S. Biological Station records this from the Upper Mississippi River at Fairport, Iowa.

37. *Alasmidonta calceola* (Lea).

Simpson—Upper Mississippi drainage. Collected by us near Fountain City, Wis. Rare.

38. *Alasmidonta marginata* (Say).

Simpson—Upper Mississippi and St. Lawrence drainage. Collected by us near Wabasha, Minn. Local in distribution.

39. *Strophitus endentulus* (Say).

Simpson—entire Upper Mississippi drainage. Fairly common. Var. *pavonius* is simply a rayed form of the preceding species, observed according to Mr. H. W. Clark where the water is clearer, and is not entitled to varietal distinction.

Sub Family Lampsilinae

40. *Obliquaria reflexa* (Raf.).

Simpson—Mississippi drainage. Red Wing, Minn. where we collected it apparently represents its northernmost distribution as Wilson and Danglade do not report it from C. and N. Minnesota. Never abundant.

41. *Plagiola lineolata* (Raf.)=*Plagiola securis* (Lea).

Simpson—Upper Mississippi drainage as far south as the Arkansas and Tennessee rivers. Always taken from mussel beds and apparently attains a great age. Abundant locally.

42. *Truncilla truncata* (Raf.)=*Plagiola elegans* (Lea).

Distribution largely that of the preceding species.

43. *Truncilla donaciformis* (Lea)=*Plagiola donaciformis* (Lea).

Distribution largely that of the preceding species.

44. *Leptodea leptodon* (Raf.)=*Lampsilis leptodon* (Raf.).

Simpson—Upper Mississippi drainage south to Tennessee River. Found by Baker, (1), and Pratt, (13) in Iowa, but possibly more abundant toward the Ohio. Not observed, but Mr. Clark reports one dead shell from main river above Fairport, Iowa.

45. *Leptodea fragilis* (Barnes)=*Lampsilis gracilis* (Barnes).

Simpson—entire Mississippi drainage. In our experience more abundant in lower portions of the river.

46. *Proptera alata* (Say)=*Lampsilis alata* (Say).

Simpson—entire Mississippi drainage as far south as Arkansas. Common.

47. *Proptera lævissima* (Lea)=*L. lævissima* (Lea).

Distribution largely that of preceding species. Many specimens were found on sand bars.

48. *Proptera capax* (Green)=*Lampsilis capax* (Green).

The type locality of this species is the falls of St. Anthony, Minn. Holzinger (7) reports it from Winona, Minn., but the consensus of opinion is that it ordinarily does not go much north of Davenport, Iowa.

49. *Obovaria retusa* (Lam.)

The evidence indicates that if this species is present in the

Upper Mississippi drainage, it is restricted to the regions near the Ohio.

50. *Obovaria olivaria* (Raf.)=*Obovaria ellipsis* (Lea).

Simpson—Upper Mississippi drainage as far south as the Arkansas and Tennessee Rivers. Collected by us near Red Wing, Minn. Rare in L. Pepin and as Ortmann (10) indicates, it prefers strong steady currents. More abundant further down stream. Not reported from N. and C. Minnesota.

51. *Actinonaias carinata* (Barnes) =*Lampsilis ligamentina* (Lam.).

Throughout the Upper Mississippi drainage, but rare in L. Pepin. Fairly common. Reported from the Crow Wing drainage by Wilson and Danglade.

52. *Carunculina parva* (Barnes)=*Lampsilis parva* (Barnes).

Lake Pepin. Reported from S. Minnesota by Call, (3). Becomes more common descending the river. Not reported from N. and C. Minnesota.

53. *Ligumia ellipsiformis* (Con.)=*L. ellipsiformis* (Conr.).

Simpson—Upper Mississippi Valley south to 38° latitude. Geiser (5), and Pratt (13), report it from Iowa. We did not collect it north of there, nor does it extend into Central and Northern Minnesota.

53*a*. *Ligumia subrostrata* (Say)=*L. subrostrata* (Say).

Reported by Simpson, (14) as occurring north to latitude 41°. We collected this species near Fountain City, Wis. indicating a more northerly range. Rare. Mr. Clark states it to be fairly common along the edges of the sloughs and that it is often represented by a large form originally described as *Unio mississippiensis.*

54. *Ligumis recta latissima* (Lam.)=*Lampsilis recta* (Lam.).

Common. Extending throughout the Mississippi drainage into N. and C. Minnesota. The typical *recta* is the small Great Lakes form. The typical Mississippi form is that given.

55. *Ligumia iris* (Lea)=*L. iris* (Lea).

Reported by Simpson from the St. Lawrence drainage and the Ohio drainage, Illinois and Wisconsin, indicating its pos-

sible occurrence in the Upper Mississippi. Ortmann states this form to probably be the var. *nov-eboraci.*

56. *Lampsilis anodontoides* (Lea).

Not reported from the drainages of N. and C. Minnesota, although Simpson reports it distributed throughout the entire Mississippi drainage. It was found occasionally at points between Red Wing and La Moille, Minn., except in L. Pepin, where its place is apparently taken by the next named species.

57. *Lampsilis fallaciosa* (Smith).

Occasionally species were found within the limits given for the preceding species. More abundant in L. Pepin and quieter waters such as those of the sloughs.

58. *Lampsilis siliquoidea* (Barnes)=*L. luteola* (Lam.).

Simpson—entire Mississippi drainage. Abundant in *L.* Pepin, more so than in other parts of the river. As Ortmann (13) remarks, it prefers "rather quiet water and sandy, muddy bottoms. In these regions it apparently produces a large number of pearls."

59. *Lampsilis fasciola* (Raf.)=*L. multiradiata* (Lea).

Simpson—entire Ohio River drainage. Ortmann reports it from the Illinois River in Illinois. There is thus a fair probability of being found in the lower stretches of the Upper Mississippi River.

60. *Lampsilis ventricosa* (Barnes).

Abundant. Wilson and Danglade (18) report it from the St. Croix, Minn., Crow Wing and Red River of the north drainages. Simpson—entire Mississippi drainage. In connection with this list, it should be remembered that the Crow Wing is the modern representative of the headwaters of the Mississippi.

61. *Lampsilis orbiculata* (Hildreth).

Reported by Baker (1) from McGregor, Iowa. This at present seems to be its most northern record. Rare. It probably intergrades with the next species.

62. *Lampsilis higginsii* (Lea).

This species was collected at Red Wing, Minn., L. Pepin and points near Winona, Wis. Not reported from C. and N. Min-

nesota. Comparatively rare. The type locality is Muscatine, Iowa. The var. *grandis* does not seem to be clearly distinguished from its parent species.

63. *Dysnomia* (*Truncillopsis*) *triquetra* (Raf.)=*Truncilla triquetra* (Raf.).

Reported from Iowa by Pratt (13) and Witter (19). We collected two specimens in L. Pepin—an expansion of the Mississippi in S. Minnesota. This probably represents the most northerly record. Reported from Fairport, Iowa, by Mr. H. W. Clark.

In conclusion, acknowledgment is made to Dr. A. E. Ortmann, Carnegie Museum, Pittsburgh, Pa., Mr. H. W. Clark, U. S. Biological Station, Fairport, Iowa, and Dr. Bryant Walker, Detroit, Michigan, for criticisms kindly given toward the preparation of this manuscript.

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SILAS C. WHEAT.

Silas C. Wheat, well known to many conchologists, died at Middlebury, Vt., September 1, 1922. Although nearly 70 years of age, he apparently was hale and hearty and enjoying a summer's vacation when he suffered a stroke, dying almost immediately.

Mr. Wheat was born in Franklin, Delaware Co., N. Y., in 1853, where he graduated from the Franklin Academy and then attended the New York University School of Pedagogy, qualifying as a teacher. He taught in New York City, was principal

of a school at Madison, N. J., and since 1893 followed his profession in the public schools of Brooklyn, retiring in 1910.

He was one of the founders and at one time president of the Brooklyn Conchological Club, publishing in 1907 the following articles in the Bulletin of the club: "Abnormal Shells;" "Shells in City Gardens and Ponds," and in Science Bulletin, Vol. 2, of the Museum of the Brooklyn Institute, he described *Acmaea fergusoni* and *Urosalpinx cinerea* var. *aitkinae*. In THE NAUTILUS he published "Land Shells from East Shore of Cayuga Lake", "The Genus Elysiella" and a number of notes. His "Report on the Mollusks of New Jersey" for the State Museum at Trenton and a similar one on the "Mollusks of Long Island" for the Brooklyn Institute are still pending publication.—C. W. J.

NOTES.

FERRISS COLLECTION INJURED BY FIRE. We regret to learn that the home and part of the collection of Mr. James H. Ferriss, of Joliet, Ill., was destroyed by fire on November 18. Nearly all of his geological specimens, fresh water shells and ferns were destroyed, but his valuable collection of land shells was saved with little damage. Mr. and Mrs. Ferriss were in the desert region of New Mexico at the time, in company with the senior editor of THE NAUTILUS.

CRENELLA FABA MÜLLER ON THE COAST OF MAINE. This species was determined by Dr. Dall, who says: "This is a northern species described from Greenland and found as far south as the Straits of Belle Isle, and I think Nova Scotia; yours is further south than any previous locality noted." I dredged one live specimen in from 8 to 10 fathoms, outside the Rockland breakwater, August 19, 1922.—N. W. LERMOND.

A CORRECTION. One of our subscribers has called our attention to a discrepancy. The cover pages are all right, Vol. XXXVI, on both the July and October numbers, but on pages 1 and 37 it is Vol. XXXV. Please correct this error.

A Scalariform Specimen of Zonitoides minusculus alachuanus Dall. This interesting example was found among numerous normal specimens in a pile of old brick, at Gainesville, Florida, Jan. 1, 1916. The nucleus and first whorl are normal, then it suddenly becomes scalariform. What caused the whorls to separate is not possible to determine. The shell is 3 mm. in height, while a normal specimen with the same diameter, is less than one.—T. Van Hyning.

Arion hortensis Drap. in Maine. In June while at Bar Harbor, Maine, it was very rainy; the result was that an unusually large number of slugs were seen, varying in color from a bright yellow to brown with the lateral stripe obsolete or wanting. Some were sent to Dr. Pilsbry who says: "I have made colored figures of those sent me, as it is the first time I have seen the real *Arion hortensis* alive. The old records in the catalogues are mainly *Arion circumscriptus* Johnst."

In 1920 I found a very large yellow slug at Bar Harbor, that I took to be *Limax flavus*. It died on my way home so that I could not positively identify it. Although as I remember the specimen it seemed different than the specimens of *A. hortensis*, still I cannot be certain and the record in The Nautilus, Vol. 35, page 134, should be questioned.—C. W. J.

Viviparus japonicus v. Martens from another locality in Boston. This species which was referred to as *V. malleatus* Reeve in The Nautilus, Vol. 29, p. 35, 1915, but which Dr. Bryant Walker considers *V. japonicus*, (see Miscellaneous Publication, No. 6, Mus. of Zool., Univ. Mich., p. 126, 1918) was found in Jamaica Pond, by Harold A. Rehder, July 6, 1922. He revisited the place on September 7, and saw several specimens in much deeper water than they were on the previous occasion. In Sargent's Pond, Brookline, Mass., he found *V. contectoides* W. G. Binney. This species is still abundant in the lake in the Public Garden, Boston, where it was introduced in 1916, see The Nautilus, Vol. 30, p. 72.—C. W. J.

Observations on Landshells of Stanley Park, Vancouver, B. C. Whilst staying in Vancouver this summer for rest and change after eight years' hard work in Hawaii, several trips were taken to Stanley Park for the purpose of collecting any landshells that might be found.

Results, however, were very disappointing, as only four species were found, and these in very small numbers.

No fresh-water species were to be seen although careful search was made.

The two species of Polygyra were usually found upon the leaves of the Skunk Cabbage (*Spathyema foetida*), whilst the Haplotremas were to be found on the ground amongst dead leaves, moss, and rubble. Species found.

Haplotrema vancouverensis (Lea). *Polygyra columbiana* (Lea).

Haplotrema sportella (Gld.). *Polygyra germana* (Gld.).—C. F. Mant.

PUBLICATIONS RECEIVED.

Notes on the Radula of the Helicinidae. By H. B. Baker (Proc. Acad. Nat. Sci., Phila., 1922, pp. 29–67). A valuable and interesting study of the radulae of the American species. Many changes are made to the classification of A. J. Wagner (1905, 1907–1911) based solely on operculum characters, Wagner also disregarded previous writers and the law of priority; of the 36 new groups proposed by him for American Helicinidae, only about 16 can be used. The paper is illustrated by five plates containing 37 figures of radulae.—C. W. J.

The Molluscan Fauna of the Big Vermillion River, Illinois. By Frank C. Baker (Ill. Biol. Monographs, Vol. 7, No. 2, pp, 105–224, 15 pls., 1922). A most interesting faunal paper. An account of the physical feature is followed by chapters on general distribution and systematic discussion of the mollusca; 65 species are recorded of which 36 belong to the Unionidae. The pollution of Salt Fork by sewage is discussed. The illustrations are excellent.—C. W. J.

Pleistocene mollusca from Northwestern and Central Illinois. By Frank C. Baker (Jour. of Geol., Vol. 30, pp. 43–62, 1922). Some supplementary studies to the author's work on "The Life of the Pleistocene."

History of Lymnaea emarginata Say. By Olof O. Nylander (Maine Naturalist, Vol. 2, pp. 74–77, 2 pls., 1922). An account of the rediscovery of this interesting shell.

The Histological structure of the gills of the Najades with special reference to the Histology of the groove along the edge of the inner gill. By Hiram J. Bush (Amer. Midland Nat., Vol. 8, pp. 89–104, 1922). A biological paper of interest in the study of Unionidae.

The Champlain Sea. By Winifred Goldring (N. Y. State Mus. Bull., Nos. 239–240, 1920 (1922), pp. 153–187, pls. 1–3). A paper of special value to a conchologist, as well as a geologist. It shows how marine animals can be divided into groups according to their ability to live in water of various degrees of salinity. *Macoma balthica*, *Yoldia arctica* and *Saxicava arctica* are found in the pleistocene, as far south as Fort Henry and vicinity. At Burlington ten species of marine mollusks are found.—C. W. J.

Journal de Conchyliologie, Vol. 66, No. 4, Oct., 1922. Revision des Carditacea vivants du Muséum National d'histoire Naturelle de Paris. Par Edouard Lamy, pp. 289–368.

Note sur un cone fossile senestre. Par A. Loville, pp. 369–370.

Fossil Chitons of Western North America. By S. S. Berry (Proc. Cal. Acad. Nat. Sci., Vol. XI, 4 Ser., pp. 399–526, pls. 1–6, 1922). This is an excellent paper on a much neglected group. The author believes that the chitons will prove among the best criteria for determining the age and relationships of any of the formations in which they can be found in any number. One new genus, *Oligochiton*, two new species

and a new subspecies are described among a total of some 33 species.—C. W. J.

Observations on the Rate of Growth of the Shells of Lake-dwelling fresh-water Mussels. By N. M. Grier (Amer. Midland Nat., Vol. 8, pp. 129–148, Nov., 1922). The age and rate of growth were obtained by counting the lines of growth on each specimen and these are tabulated under each species. Shells grow most rapidly in the earlier years of their lives and none of the shells reported upon had reached an extreme old age. A useful paper in connection with the propagation of these shells.—C. W. J.

Biology and Economic Value of the Sea Mussel, Mytilus edulis. By Irving A. Field (Bull. Bureau of Fisheries, Vol. 38, pp. 127–259, 1922.) A very exhaustive treatise on the anatomy and physiology of the Sea Mussel. Its embryology and growth is fully described and figured. An account of its enemies and parasites, is followed by a chapter on its value as an article of food. The valuable paper ends with an excellent bibliography.—C. W. J.

The Journal of Conchology, Vol. 16. No. 10, Oct. 1922.

Some uses of shells in the Belgian Congo. By F. M. Dyke, p. 309.

The Helicoid group Callina, Lowe. Description of a new species. By T. D. A. Cockerell, p. 310.

Three Cephalopods new to Dorset. By T. Edw. Belcher, p. 312.

On Sunetta hians Reeve. By J. R. Le B. Tomlin, p. 312.

On the Association and Non-Association of Helix nemoralis and Helix hortensis. By W. Cartwright, pp. 313–319.

Land and freshwater Mollusca of Winoley in North Wilts. By Douglas Bacchus, pp. 320–323.

Paludestrina confusa in the Waveney Valley. By C. Oldham, p. 324.

Pisidia of Guernsey and Sark. By J. R. Le B. Tomlin, p. 328.

The Nautilus.

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AN EXPEDITION THAT FAILED.

BY CHARLES T. SIMPSON.

On the morning of the 23d of last January Dr. Edward Mercer, his nephew of the same name, and the writer left Miami in the car of the former for a trip to Northwest Cape Sable on a snail-collecting expedition. The Doctor and I had visited the same general region before, taking in Middle and East capes, running with the auto down to Flamingo and on back along the prairie to a point in the rear of them, then leaving our machine and tramping across a wide, deep swamp over an old trail out to the open beach.

We ran the fifty miles from Miami to the Royal Palm Park in a little over an hour over a beautiful oiled road and then down the Ingraham Highway across the open Everglades towards our destination. This road was not so fine as the first stretch but we made fairly good time over it and reached Flamingo on Florida Bay, a matter of perhaps twenty-five miles more, in about the same time we made the first run. There we were informed that one or more great canals had been cut from the back country and that we could only get to the old deserted clubhouse on the bay shore, a matter of six miles farther. We camped at this building, a ramshackle affair set up eight feet on posts and built by a land company, spreading our beds on the floor of the gallery and making coffee in a

pail which we picked up. The other two hunted up a couple of old tin cans to drink out of while I dug a brand-new tin cup out of my bag, and this gave me a sort of social standing not enjoyed by the rest.

In the morning we started afoot along the beach intending to visit East Cape, where there is an extensive grove of coconuts and a considerable area of hammock. Along the low shore and back for a great distance grew a forest of Avicennia or black mangrove and everywhere we found its strange "quills", covering the ground in places. These usually grow straight and sometimes to a height of more than two feet; they may be as large as one's little finger, and they act as pneumatophores or breathers to pump oxygen from the air to the tree. Often they stand so close that they nearly touch, and it is almost impossible to work one's way through them. On the beach they are matted and twisted grotesquely, and thousands of them were thrust through the valves of pelecypod mollusks, Arcas, Tellinas, Cardiums, Labiosas, Loripes and Pholas, while other thousands bore aloft such gastropod shells as Strombus, Melongena, Polinices, Oliva and the like. Many of the bivalve shells are quite thin just below the beaks, and holes are often broken through them at this point as they are dashed about in the sea and on the shore. These with the univalves had been thrown upon beds; the "quills" had pushed their way up and in many cases through the holes of the valves, and into the apertures of the gastropod shells, lifting them on high as they grew up.

Within half a mile of the cape we came to a newly dug canal, thirty feet wide and quite deep, which was carried far out into the shallow bay. Its banks were so steep we could not have climbed out if once we got in and it would have required a long wade in the soft mud to go out around it. The Doctor suggested that as I was taller than he and was the chief conchologist it was up to me to lead the way and I countered by saying that if I was as young as he was I wouldn't hesitate a moment. Then he said "Pshaw, there is only a scrub hammock at East Cape and we were there not long ago; it isn't worth while bothering our heads about it anyhow!" So with

this "Sour grapes" observation we turned back and agreed to call it "An Expedition that Failed."

Leaving the club house we drove back over a wide prairie which was skirted by a large number of hammocks. We stopped at one of these and on entering it a most astonishing sight met our eyes. On almost every tree we found a considerable number of young *Oxystyla floridensis* and by standing in a single spot I could count more than I ever saw in all my life. These snails become completely dormant during the dry season, gluing themselves fast to the bark or other smooth surfaces of trees in any place where they can be somewhat concealed.* They are attached by an epiphragm so solidly that the shell will almost always crush without letting go and the only way of removing them without injury is to cut under the whole carefully with a knife. Every knot and depression in the bark, every space between brace roots was covered with these snails. In the forks of limbs, between two nearby trunks or any surface partly screened they were crowded together. A large piece of dead bark had fallen against the trunk of a Jamaica dogwood and on taking it away I saw a space six inches wide and two feet long not only covered but having them two and three deep. A branch a foot or more in diameter had broken from a tree a short distance above the ground and had decayed so that a smooth-sided cavity perhaps eight inches across remained. The inside of it was crammed down as far as I could see in the semi-darkness. I ran a stick down it in order to find any rattlesnakes that might be in it; and hearing no disturbance I carefully thrust my arm down it and found the walls occupied with the snails nearly to the ground. Counting the number on a space six inches square on a nearby tree and making an estimate I concluded that there were at least five hundred specimens in this hollow limb! A very few of these were adult, probably three years old; perhaps five per cent had made a second growth and may have been two years of age but the rest had only formed one black growth-line and were yearlings. Hitherto I

* For an illustration of this see my book "In Lower Florida Wilds," pp. 352, 356.

had only found this snail in limited numbers; now the woods were full of them, the market was glutted; the price at once went down and I hardly considered them worth collecting.

Then I immediately launched a theory. I said that the previous summer and fall had been unusually wet, that the rain had been well distributed, making conditions wonderfully fit for snails, that every Oxystyla egg in the hammock had doubtless hatched and lived. I believed I would find a large number of these snails in every one I might visit and to prove that I was right I went to the next hammock, which was only a few rods away, and found *absolutely nothing.* Not a dead or broken shell, not even a fragment! I visited a third not far away and got a very few Oxystyla and *several dead Liguus.* Then we ran a short distance to a fourth and found a different subspecies of Liguus and *no Oxystylas!* Then I threw my theory on the scrap heap as I had done with many others.

Perhaps it may be well to say something about the remarkable region which composes the extreme lower part of the mainland of Florida and the astonishing distribution of its Liguus. I believe that the land and water of this area are as complicated as they are in any part of the globe, in fact Mr. W. J. Krome who surveyed the whole territory for the Florida East Coast Railway informed me that there were thousands of acres of surface which were neither the one or the other. My experience in exploring a considerable part of it fully agreed with what he told me. Probably none of the natural land is more than two-and-a-half feet above an ordinary high tide and in places it is cut up by channels which vary greatly in width, with mudholes, pools, ponds and lakes. Some of these are fresh during the rainy season, others are brackish during the entire year. Large areas are inundated during the summer and fall that dry up and become mud beds in winter and spring. Land that is a little higher than this is usually covered with mangroves or Avicennias, the latter a large tree, while the drier littoral is overgrown with tropical buttonwood. Here and there the ground is a few inches higher, the result of the decay of rich vegetation, and on such spots hammock growth has sprung up. All the conditions are favorable for getting lost

and I have been with at least three persons long resident in the region who became hopelessly confused and for a time were not able to tell where to go. It is a fine place for big diamond rattlesnakes and water moccasins, and one will do well to watch where and how he steps.

I have said that the distribution of the Liguus in this region is astonishing; it is even amazing! At first sight it appears to be haphazard; it would seem as though some giant had strode over the entire region and from a bag of mixed Liguus had sown as a sower would scatter grain. But this is not entirely so. There are certain centers from which a given form or forms seem to be distributed, but one does not observe this at first. The subspecies *lossmanicus* seems to occupy exclusively the island from which it is named and this may be its center of distribution. At Northwest Cape I found *capensis* only; apparently another center and no Oxystyla were found there. At Rogers River *lineolatus*, *roseatus* and *castaneozonatus* occurred and what I take to be *lossmanicus* was brought to me from Harney River. There are two hammocks at Middle Cape, separated by a narrow mangrove swamp. In the northern and smaller one Dr. Mercer and I found *lossmanicus*, *castaneozonatus* and hybrids between the two, *lineolatus* and a fine living *marmoratus*. Across the five-rod swamp in the other hammock are all the forms in the north forest and in addition *matecumbensis* and *eburneus*. East Cape has beautiful *roseatus*, *lineolatus*, *cingulatus* and *eburneus*. In and around Flamingo *matecumbensis* and *eburneus* are abundant, but one hammock may have only one and a second another; and this seems to be the metropolis of both. Near Mr. Roberts' home I found specimens of a large *castaneozonatus* with a broad revolving band running unbroken nearly to the tip of the spire, and this form occurs on the middle of Key Largo and at the west end of Madeira Bay, twenty miles east of Flamingo. *Capensis* occurs in isolated spots; on Jo Kemp's Key, on a long tongue of land in Florida Bay six miles to the eastward, inland four miles northeast of Jo Kemp's Key and in an inland hammock back of Middle Cape. In the vicinity of Madeira Bay a form occurs that is probably *livingstoni*. I could give other instances of broken and scattered distribution in this general region but they are not necessary.

This remarkable dispersal of Liguus and Oxystyla cannot be explained by supposing that the region was once higher than at present and was covered by a continuous growth of hammock, for if this had been the case we would find most of the different forms pretty well distributed over the entire area. In the Lower Keys which once formed a single forest-covered island we find nearly all of the subspecies of *Liguus solidus* in practically every locality. These snails did not crawl from one hammock to the other as they do in pine woods. I have never seen one of them on wet ground and I feel sure that a swamp or any littoral ground is an absolute barrier to their passage. The three capes are connected by low, sandy beach with a deep morass just back of it and any Liguus or Oxystyla which attempted to travel on this sand would become clogged in it before going five feet. The other hammocks between the prairie and swamp which I have mentioned are as completely barred against the passage of tree snails from one to another as if the sea was between them. In the dry season they are dormant and are not gravid; during the time of the rains the ground between the different hammocks is either swampy or under water.

The key to the mystery of distribution consists of one word —*hurricanes!* Hurricanes broke off or washed out the trees on which their progenitors grew in Cuba, these trees were swept into the sea on the great floods produced by them, they have helped to sweep these trees along the Florida Strait and have produced unusually high tides on which they were driven out over and by which they were deposited on our shores. There are a number of forms of Liguus living in Cuba today that are the analogues of subspecies inhabiting our state. Most of these were landed on our Upper Keys and from there migrated across to the mainland of Lower Florida over an old but now destroyed land-bridge. The *castaneozonatus*, *roseatus*, *lineolatus*, *cingulatus*, *matecumbensis* and *marmoratus* of the upper chain are identical with forms on our lower mainland, and *luteus* of these islands is found in the hammocks of the southeast coast. *Capensis* is close to *vacaensis*.

These Liguus were established in the region I have discussed

and were dispersed over it by hurricane action. The Bay of Florida is shaped something like a blunt cow's horn, its southern shore being the Florida Keys and the northern one the lower edge of the mainland, while its wide base opens to the west. Whenever, during one of these great storms the wind blows from a westerly direction the water of the sea is driven into the bay with great force and it overflows the entire lower portion of the mainland, *often to a depth of six or seven feet!* Trees growing in this region and bearing Liguus or Oxystyla are broken off or they may be uprooted and with their living freight swept along on the angry flood in any direction, perhaps, sometimes for several miles. The snails are able to cling to the branches on which they live and to stand immersion in water for many hours. Finally when the storm ceases and the water goes down they are landed in a new place, probably a hammock where it is easy for them to crawl off, climb the nearest tree and at once establish a new colony. This will account for the fact that one hammock will have one or more species, the next another lot and a third nearby no Liguus at all. The hurricanes are hit and miss sowers.

VARIATIONS IN GONIOBASIS EDGARIANA LEA.

BY CALVIN GOODRICH.

Caney Fork, Tenn., a branch of the Cumberland river, supplied Lea with several of his types of Pleuroceridae and Anthony with at least two of his. Associated with the early collections from the stream are the names of Sellers, Edgar and Troost which one comes upon frequently in the literature of American freshwater mollusks. A probable fourth visitor to Caney Fork was Safford, who appears to have lived at Lebanon, not far from this river. Wetherby touched at one spot in the drainage in the 1870's. I suspect that I was the next conchologist there, collecting between rains and floods in 1920. The year following, with a merciless sun to contend with instead of high waters, Miss Mina Winslow made an admirable collection. Dr. Ortmann did still more work in the stream in 1922.

Caney Forks drains a section of the western escarpment of the Cumberland mountains. One tributary, Calfkiller river, follows a broad valley at the base of the highlands. Collins river, a second branch of many forks, approaches Walden Ridge toward the southeast and issues in the southwest from the ridge upon whose further side is the Duck river.

The characteristic univalve of the drainage is *Goniobasis edgariana* Lea, ranging closely to *G. laqueata* Say and only remotely, it seems to me, to *G. nassula* Conrad, under which Tryon consigned *edgariana* as a synonym. It is a large shell for the genus, typically striate-plicate, with flattened whorls and a subangular base in immature specimens. Studies of the variations by localities brought out the following facts:

Calfkiller river, at Calfkiller, Putnam County—This is within four or five miles of the beginning of the stream and is apparently the highest spot reached by shell life. Of 580 specimens taken, 85 per cent has the plicate sculpture only. The remaining 15 per cent are plicate-striate. The sculpture ceases when the shell is about half-grown and thereafter consists only of nearly microscopic growth-lines. It is convenient to speak of that appearance as smooth. Only two shells were found with indications of color bands. In respect to color and texture, the shape of the aperture and the form of the outer lip, the shells correspond to typical *edgariana.*

Town creek, a branch of Calfkiller river, near Sparta, White County—Collections made by Miss Winslow, about 325 shells. The typical plicate-striate sculpture is present in 69 per cent. As the shells grow the plicae tend to disappear. In the case of 89 specimens, the last whorl is striate only, in all it is smooth. Both adults and young are included in this count and it might be explained that the sculpture is persistent in nearly all the full-grown examples and wholly absent only in a few. Two shells are plicate without having the revolving striae. Dr. Ortmann's collection at this locality did not differ from Miss Winslow's.

Two shells in my collection labeled simply "Calfkiller river" and a single lot in Dr. Walker's cabinet, similarly designated and carrying Wetherby's identification, *G. caliginosa* Lea, are of this form.

Barren Fork, branch of Collins river, McMinnville, Warren County—Thirteen shells taken by Wetherby. Eleven adult and nearly adult specimens are plicate-striate to the last whorl. Two retain only the revolving striae upon this whorl. These are more nearly like the types, credited to Caney Fork proper, than any *edgariana* from the main stream I have seen outside of the Lea collection. Dr. Ortmann's shells from this place were so like Wetherby's that I have not studied them intensively. An interesting note made by Dr. Ortmann was that the young *edgariana* he found here were in a shallow branch.

Hickory creek, branch of Barren Fork, two miles south of McMinnville—156 shells, almost all adult. Except three, these specimens are plicate-striate from apex to base of last whorl. The three are striate, but not plicate, on the ultimate whorl.

Caney Fork, Riverhill, White County—45 shells taken by Dr. Ortmann. Thirty-seven shells have plicate-striate apex, six are only plicate at the apex; two specimens are so eroded that the sculpture cannot be made out. In the case of 21 examples, the base is more or less distinctly striate; the base in 24 is smooth. None is plicate to the last whorl as is common with the *edgariana* from Barren Fork and Hickory creek. This is a rough, heavy lot, tending apparently to lose the distinctive sculpture of the species.

Caney Fork, below dam at Falls City, Warren County—270 shells taken by Miss Winslow. The specimens plicate-striate to the last whorl amount to 80 per cent, but not one is adult. Even in the instance of the young shells, there is a slight tendency for the plicae to become obsolete. Fourteen are striate on the last whorl, six are smooth. Of the full-grown individuals, 13 are striate to the base, 22 are smooth upon the last whorl. The material of two other lots, collectors unknown, correspond to this form.

Butts creek, DeKalb County—Nineteen shells. Here the plicate-striate sculpture is confined entirely to the early whorls and in one example the apex is striate only. The last whorls of all the shells are smooth. These mollusks seem to be identical with *Melania columella* Lea.

The species occurs also in Stone's river, Rutherford County,

Tenn., another tributary of the Cumberland. It has been taken there by Wetherby and Ortmann. The shells are more convex than the Caney Fork forms, the revolving striae are stronger and more persistent, the last whorls of some of the young are rounded rather than subangular. Of 26 shells of a lot in Dr. Walker's collection, 24 are plicate-striate on all whorls. In two specimens, the plicae have disappeared before the last whorl is reached. The Stone's river form corresponds with *Melania corrugata* Lea.

While nearly every colony of *edgariana* varies from other colonies, it does not, as in the case of *Io*, vary with reference to any particular position in the stream. The most elaborately sculptured forms occur in Calfkiller river, presumably after the river stage is reached; in a branch of this stream and in branches of Collins river. A more simple form lives in the headwaters of Calfkiller river and the tendency of the species in Caney Fork at Riverhill and at the falls is toward simplification. That environment has an influence in this matter is not clear, for Barren Fork, at the time I saw it, was swift and rough; Hickory creek, having the same form of *edgariana*, was a slow-moving stream. Conditions in the upper Calfkiller river and those at the falls of Caney Fork would correspond only at a time of freshet.

The habitat in upper Calfkiller river was clear, gently-flowing water, six to eighteen inches deep. The shells occurred in all parts of the stream, upon stones and a small sandbar. In Hickory creek, nearly all *edgariana* were taken from limestone rocks exposed by the channel. While Barren Fork, just below, was on a rampage, Hickory creek had the current of a prairie brook. So I judge it is seldom swift. Dr. Ortmann writes that at Riverhill, the shells occurred "in riffles, on rocks; also in slowly flowing water along banks, on mud." The habitat at McMinnville, he describes as "riffles with coarse gravel; the very small ones were found in a shallow branch among fine gravel." In Town creek, he found the shells "in quiet pools and eddies on mud and sand as well as on ridges of limestone crossing the creek."

The synonymy of this species is:
Melania edgariana Lea, March, 1841.
Melania columella Lea, March, 1841.
Melania caliginosa Lea, March, 1841.
Melania concinna Lea, March, 1841.
Melania corrugata Lea, March, 1841.
Melania rugosa Lea, Dec., 1842.
Melania coricina Anth., Dec., 1850.
Melania sellersiana Lea, 1852.
Goniobasis purpurella Lea, May, 1862.

Pillsbry * has made *M. corrugata* and *rugosa* synonyms of *G. laqueata* Say. As *edgariana* is a sort of robust stepbrother of *laqueata* the transfer I have suggested in the position of the two species is of no great importance.

ASHMUNELLA HEBARDI, A NEW SNAIL FROM THE HACHETA GRANDE MOUNTAINS, NEW MEXICO.

BY H. A. PILSBRY AND E. G. VANATTA.

In his summer campaign for Orthoptera in company with Mr. Rehn, Mr. Morgan Hebard visited the northwestern slope of Hacheta Grande. Ascending in a broad canyon, he found landshells at about 7600 ft. *Holospira crossei* Dall and *Oreohelix hachetana* Pils. do not differ from the specimens already known from about a thousand feet higher, at the summit of the mountain, where one of us collected in 1910. The *Ashmunella* obtained, while related to *A. mearnsi*, is rather conspicuously distinct.

ASHMUNELLA HEBARDI n. sp. Shell of about the size and color of *A mearnsi*, but differing (1) by the presence of an acute peripheral keel near the top of the whorl, the upper surface of the last 3 whorls nearly flat, the last whorl impressed above the keel; the base strongly convex, (2) the straight parietal callus is much more strongly raised, (3) the surface is distinctly

* Proc. Acad. Nat. Sci., Phila., 1896, p. 499.

though finely striate, the striae partially interrupted forming long granules. The teeth are substantially as in *A. mearnsi.*

Height 5, diam. 14.7 mm.; 5½ whorls.

By its acute keel and minutely roughened surface this form resembles *A. walkeri* Ferr. of the Florida range; but that is a smaller species with weaker sculpture, an adnate parietal callus and a simple parietal lamella. *A. kochi* Clapp of the S. Andraes range is larger, smoother, not acutely carinate, and has not a raised parietal callus.

All of the specimens are dead shells more or less bleached. The amount of granulation visible on these "bones" is variable, especially on the base. Doubtless living shells would show it more strongly, and possibly with cuticular scales. The surface is dull, not glossy as in living *A. mearnsi.* In one example some fine incised spiral lines can be made out on the base.

Type is 131409 A. N. S. P. Paratypes, 6 specimens, No. 131339.

MOLLUSCA FROM THE DREDGING OPERATIONS AT KEWALO HARBOR, HONOLULU, 1921.

BY CHARLES F. MANT.

During several months of last year the Hawaiian Dredging Company was engaged in deepening the small harbor at Kewalo in order to accommodate the Japanese fishing fleet.

The dredged material was pumped through large iron pipes, and discharged upon a piece of waste ground, thus giving a good opportunity for the examination of the molluscan life of this part of the bay.

As often as possible visits were paid to the scene of operations, and many thousands of shells, mainly in a "dead" condition, secured, amongst them species that are rarely if ever found by the ordinary means of collecting, and others that were new to science.

It was quite amusing to notice how that, when one appeared

the men, women, and children busy collecting shells, bits of coral, &c. would pass the word around, "Here comes the shell man", and they would crowd up with buckets, tins, and tobacco boxes containing their "finds," and a selection would be made for which a small consideration would be given, both parties being quite satisfied. Some of the people were set to collecting the many minute shells to be found amongst the piles of coral sand, rock, and debris, and in this way a number of most interesting species were discovered.

Over 150 species of mollusca were collected, and Professor Dall of the National Museum has most kindly examined and named many of them.

The following is a list of species gathered by the writer, and from this a good idea of the molluscan life in a limited area of these waters can be obtained.

Alaeocyma thaanumi Dall.
Alcyna kapiolaniae Pils.
rubra Pse.
rubra multicolor Dall.
Alectrion hirta Kien.
ravida A. Ads.
Atys cornuta Pils.
Biforina cingulifera Hds.
corrugata Hds.
decorata Pse.
flammulata Pse.
Bittium boeticum Pils. & Van.
boeticum unilineatum Pse.
Cassis vibex L.
Cerithium obeliscus Brug.
lacteum Kien.
Columbella (Alia) moleculina Duclos.
orphia Duclos.
urania Duclos.
varians Sowb.
Conus abbreviatus Nutt.
catus Hwass.
hebraeus. L.
lividus Hwass.
marmoreus L.
nussatella L.
omaria Hwass.
generalis L.
pulicarius Hwass.
quercinus Hwass.
striatus L.
textile L.
Coralliophila neritoides Lam.
Cylichna anagogia Dall.
Cymatium pilearis L.
bracteatus Hds.
obscurus.
tuberosus Lam.
Cymatosyrinx mighelsi Dall.
Cypraea caputserpentis L.
carneola L.
circicula v. tricornis Jouss.
helvola L.
isabella L.
madagascariensis Gm.

peasei Sowb.
recticulata Mart.
semiplota.
sulcidentata Gray.
talpa L.
tessellata Swain.
Daphnella sandwichensis Pse.
Daphnobela manti n. sp.
Dibaphus edentulus Swain.
Drupa morus Lam.
ricinus L.
tuberculatus Blainv.
Engina idosia Duclos.
Erato sandwichensis Pse.
Iopas sertum Brug.
Liocerithium thaanumi Pils. & Van.
Liotia ednae Dall.
Marginella acaria Dall.
Melanella acicula Gld.
opaca Sby.
pusilla Sby.
Minolia striatula Garrett
Mitra astrica Rve.
aurantia Gm.
auriculoides Rve.
consanguinea Rve.
cophina Gld.
coronata Lam.
ferruginea Lam.
flavescens Rve.
fulva Swain.
lamarcki.
lienardi.
lipara Dall.
litterata Lam.
lugubre Swain.
mitata? Dall.
ostergaardi n. sp.
peasei Sby.
kewaloensis Dall.
tabanula Lam.
thaanumi n. sp.
ticaonica vagans n. sp.
tuberosa Rve.
tusa Rve.
Mitromorpha hawaiiense Dall.
Morula ochrostoma Blainv.
porphyrostoma Rve.
Natica marochiensis.
Niso diomedae Dall.
Oliva sandwichensis.
Otopleura diminuta Dall.
Peristernia chlorostoma Sby.
cf. newcombi A. Ads.
marmorata.
xanthostigmata Dall.
Philbertia luteola Dall.
laysanensis Dall.
mighelsi Iredale.
Planaxis labiosus A. Ads.
Polynices mamilla L.
Pupa alveola Souv.
Pyramidella oahuensis Dall.
sulcata A? Ads.
Ranella (Aspella) ancepts Lam.
pusilla Brod.
Rhizocheilus madreporarum Sby.
Rissoina ambigua Gld.
miltozona Tomlin.
tridentata Mich.
stearnsi Dall.
Subulina metcalfei A. Ads.

Strombus maculatus Nutt.
maculatus var.
samar Dillw.
Terebra albula Mke.
clappi Pils.
crenulata L.
dislocata Say.
inconstans Hds.
lanceata oahuensis n. sp.
langfordi Pils.
lauta Pse.
maculata L.
nodulare Desh.
pertusa Born.
straminea Gray.
Thericium nassoide Sby.
Trifora (Biforina) cingulifera Pse.
Trochus sandwichensis.
Turbo intercostalis Mke.
Turris brevicaudata Rve.
brevicaudata var.
Vexilla turben kanaka Pils.
vexillum Chemn.

A NEW ANODONTOIDES FROM WISCONSIN.

BY FRANK COLLINS BAKER.*

ANODONTOIDES BIRGEI, new species.

Shell rather solid, elongated, cylindrical, inequilateral, inflated; anterior end broadly rounded, posterior end pointed, distinctly biangulate; ventral margin straight or somewhat concave; dorsal margin straight, forming an angle with the posterior end; dorsal margin developing a small but well-marked wing; beaks raised about the hinge line, swollen; beak sculpture as in *A. ferussacianus* but finer, with the bars close together and with a tendency to become double-looped; posterior ridge sharply rounded, very distinct, with a postero-dorsal excavated area: the shell is greatly inflated anterior to this ridge; epidermis yellowish-horn or olive, the rest periods showing as brown concentric bands; surface rayless; hinge edentulous, but reinforced beneath the beaks by swellings representing rudimentary pseudocardinal teeth; the shell beneath the ligament is also thickened; beak cavity shallow; muscle scars faintly impressed; nacre bluish-white, silvery, tinged with salmon or pinkish,

* Contribution from the Museum of Natural History, University of Illinois, No. 27.

especially below the beak cavities. Female shell not as much incurved ventrally as male shell, otherwise there is little difference between the sexes.

Length, 61; height, 30; width, 26 mm. Type.
Length, 58; height, 29; width, 23 mm. Paratype.
Length, 29; height, 17; width, 10 mm. Paratype.
Length, 82; height, 37; one valve.

The animal is similar to that of *Anodontoides ferussacianus.* Mantle connection between anal and supra-anal openings much shorter than anal; anal opening fringed with fine papillæ on the inner edge; labial palpi connected at the base as in *ferussacianus*; inner gills larger than outer gills, especially anteriorly; the inner lamina of the inner gills are free from the abdominal sac as in *ferussaciamus*; outer gills marsupial. Mantle purplish-white, openings edged with brown; gills whitish; foot and abdomen creamy-white. Glochidia similar to those of *ferussacianus buchanensis*, but a trifle smaller; length and width 0.280 mm. The breeding season is probably the same as in *ferussacianus;* gravid specimens examined in middle of August.

Ecology: Shore of a bay exposed to the full force of the waves, buried in sandy-clay or clay bottom, at depths of from two to six feet.

Type locality: Sturgeon Bay, Door County, Wisconsin, west of bridge.

Anodontoides birgei is related to *A. modesta*, having the same form of beak sculpture. It differs markedly, however, in the shape of the shell, being more cylindrical and more inflated, with a well-marked posterior ridge and with the beaks longer. The swelling of the beaks extends downward on the side of the shell, giving it a greatly swollen appearance when viewed from the dorsal margin. Comparisons have been made with *modesta* from Long Lake, near Kalamazoo, Michigan.

This Anodontoides occurs in great abundance on the shores of Sturgeon Bay and has been produced, evidently, by the lake environment. There is some variation in the form of the shell and in the degree of development of the posterior ridge. All have the cylindrical shape when mature, but young and immature individuals are more compressed and have a rounded ridge.

A small form of Anodontoides occurs in a creek, six miles east of Green Bay, which somewhat resembles *birgei*, but this form has the beak sculpture of *ferussacianus* and *buchanensis* and is referable to the latter race.

I take great pleasure in dedicating this interesting species to Dr. Edward A. Birge, President of the University of Wisconsin and Director of the State Geological and Natural History Survey.

DESCRIPTION OF A NEW LYMNAEA FROM YELLOWSTONE PARK.

BY FRANK COLLINS BAKER.*

LYMNAEA CAPERATA WARTHINI, new variety.

Shell differing from typical *caperata* in being smaller, more globose with a very short, wide spire; aperture rounder, the inner lip narrower and less reflexed over the narrow umbilical chink; whorls 4–5; sculpture of coarse spiral lines as in the type; color dark chestnut.

Length, 7.0; width, 5.0; aperture length, 4.0; width, 2.3 mm. Topotype.

Length, 6.5; width, 4.0; aperture length, 3.5; width, 2.0 mm. Paratype.

Length, 5.8; width, 4.8; aperture length, 3.5; width, 2.0 mm. Paratype.

This little Lymnaeid differs markedly from the typical form, whieh is also found in Yellowstone Park (Swan Lake, collected by Berry), in its more globose form, short spire and narrower umbilical region. It was collected by Dr. A. S. Warthin from rocks wet with spray at the foot of the Upper Falls, Canyon of the Yellowstone, in September, 1922. The specimens were submitted to the writer by Mr. S. S. Berry, of Redlands, California, who has been an untiring student in extending our knowledge of the distribution of western mollusks. It is named

* Contribution from the Museum of Natural History, Museum of Illinois, No. 29.

in honor of Dr. Alfred S. Warthin, of the University of Michigan, who collected the specimens. Paratypes are in the collection of S S. Berry (No. 5547) and of the Museum of Zoology, University of Michigan. Types and Paratypes in the Museum of Natural History, University of Illinois.

INHABITANTS OF A NATURAL AQUARIUM.

BY L. S. FRIERSON.

Red River having become choked by vast accumulations of drift-logs in the vicinity of Shrevesport, Louisiana, carried its waters to the Gulf through many side channels, which soon became possessed of high banks (as had the main river), and the lower lands between these channels acquired local names, some as "lakes," others as "bayous".

The drift however, having been cleaned out by the U. S. Government, and the side channels dammed at their heads, most of the lands constituting the Valley of the Red River are now in cultivation, even some of the former navigable lakes being cultivated.

When first explored by the writer, Bayou Pierre even at low water stage was a fairly large stream, and entitled to the name of "river".

The bed of this stream was swarming with millions of mussel shells, comprising nineteen species.

The creeks emptying into Bayou Pierre in this vicinity contained water of very different kind from that of Red River, the latter being heavily charged with gypsum, lime, and in low water stages even salt could be noticed as one of its flavoring materials. But the creek affluents of the river carry quite "soft" waters, and this difference, if not the cause, is at least correlated with a quite different mussel fauna. *Anondonta grandis* is the single species common to both creek and river.

When the head of Bayou Pierre was dammed across, there ensued of course a tremendous mortality in the naiad population, hundreds of acres of hitherto living waters becoming dry lands.

Gradually the Bayou Pierre has become converted from a stream containing the hard water of Red River to one containing the soft waters of the local creeks, and in fact is now only a large creek, going dry during droughts, except in local pools.

Between Red River and Bayou Pierre a low valley was for long known as Brown Lake, but which now is in rapid process of being put into a high state of cultivation.

A rail road, and a hard surfaced public road now traverse its former site. Alongside of the latter a ditch was dug, five feet wide and two feet deep and in the lower part of the lake site this ditch holds water for some time after rains, during which the ditch communicates with Bayou Pierre situated about a mile away.

In such flood times, fish run up these temporary streams, seeking pools in which to lay their eggs, and as these are oft-times infested with *glochidia* the bottom of the ditch above-mentioned becomes sown with young mussels.

It has so happened that the past two years have been unusually wet, and the rains have been quite equably distributed during the year, and hence the ditch in question, in its lower portion of about two hundred feet in length, has been continuously more or less full of water, until the present autumn (1922).

The writer had occasion to walk down this dry ditch and somewhat to his astonishment found hundreds of mussel shells on the bottom, some of which being collected proved of much interest.

A single *Anodonta grandis* was found, almost five inches long, showing a quite rapid growth, for it is impossible that this shell is more than *thirty months* old; most likely its age is only eighteen months.

The most interesting cases however are of the two following shells. The writer, in Nautilus, 1903, showed that *Unio tetralasnus* Say, with its several synonyms and the *Unio declivis* Say with its synonym *geometricus* Lea, were entirely distinct species, differing in shape, size, color of nacre and habitats.

This has been strikingly proven true by the changes in the local conditions outlined above. In the dried bed of Brown

Lake, great numbers of old dead shells of the *A. geometricus* can still be picked up; but in the many years of personal collecting done by the writer, no specimen of *tetralasmus* has ever been found in any Red River water. How interesting it was, then to find that the bottom of the ditch mentioned is teeming with typical *tetralasmus*, and not a single *geometricus* exists, I am sure, in this vicinity.

The latter form is universally held by all writers, inciuding Lea himself, to be a local form of *Unio declivis* Say. The single exception to this reference was Simpson, who in his Catalogue of 1914, cites the figure of *geometricus* given in Nautilus, 1903, Plate III, as being *camptodon* Say!

The population of this local aquarium however contained another surprise. For many years the writer has tried to prove by concrete material, what he was convinced to be true, that *Unio haleianus* Lea was merely an individual variant of *texasensis*; but no material had ever bcen obtained which could *prove* this *intuition.* Along with the *tetralasmus* in this ditch, the writer found hundreds of *texasensis*, and to his delight, a specimen of extra large size proved to be *typical haleianus!*

Although the bed of this little pond has been dry for the past two months, all of the *tetralasmus* are still living, and quite a number of the *texasensis* are also alive, but the majority are recently dead.

Notwithstanding that this pool of water was very seldom more than one foot deep, it seems to have been an almost ideal habitat for the three species mentioned, so long as the rains lasted.

One of the conditions which rendered this pool an almost *optimum* locality is the fact that being situated in an open commons, there is no shade, not even of weeds, to obstruct the sunshine.

It may not be known to every reader that the paucity of Naiades in the Tropics is thought by those who have collected in those regions to be largely due to the dense shade covering all but the larger streams.

The exploration of this ditch however furnished still another item of interest. As the pool dried up, the exposed *texasensis*

began to die, and their valves gaping, the exposed contents were eaten by birds, and the latter not being content with their daily dead, in several cases undertook to expedite the process by pecking holes through their valves. With such force was this done that, in every case noted, *both valves* were punctured at once. Whether this action of these birds is due to *instinct* or to *reason*, the writer being strictly a Naiadologist leaves it to other better equipped observers to decide; merely remarking that this process has been previously observed, and the pecked shells in the writers cabinet now number three, from widely separate localities.

THE ANATOMY AND TAXONOMY OF CERTAIN UNIONINAE AND ANODONTINAE FROM THE GULF DRAINAGE.

BY A. E. ORTMANN, PH. D.

(Continued from page 84.)

Lea and Simpson distinguished from *Lasmigona holstonia* a species, *georgiana* (originally described under the preoccupied name *etowahensis* Lea), chiefly on the ground that the beak sculpture is said to be not double-looped, but concentric, and that the pseudocardinals are single in each valve. This form has been reported from Etowah River, Ga., and also from Tennessee, but so far only the types of Lea (two, according to Simpson) are known. They have badly eroded beaks and rudimentary pseudocardinals. According to my experience such beaks are often seen in *L. holstonia*, and the development of the pseudocardinals is very variable. The posterior (interdental) tooth of the left valve often is very poorly developed, or even absent, and sometimes also the anterior one is obsolete, so that there is only one tooth in each valve, and, in extreme cases, even this tooth may become rather small. Such cases of reduction of the hinge teeth are seen chiefly in older shells, in specimens both from the Coosa and from the Tennessee drainage, but such specimens are always associated with normal ones. Thus I do not entertain the slightest doubt that the

"*Alasmidonta georgiana* (Lea)" is simply a synonym of *Lasmigona holstonia* (Lea).

10. Strophitus conasaugaensis (Lea).[1]

St. connasaugaënsis (Lea) (1857), *St. alabamensis* (Lea) (1861), *St. gesneri* (Lea) (1858), Simpson, 1914 pp. 351–354.

The first form is from Conasauga Creek, Gilmore Co., Ga. (only the very source of the Conasauga, for about a mile, is in Gilmore Co.); *alabamensis* comes from Talladega Creek, Talladega Co., Ala.; *gesneri* from "Uphaupee Cr., below Columbus, Ga." (surely Uphaupee Creek, Macon Co., Ala., tributary of Tallapoosa River (Alabama drainage); it is, however not "below" Columbus, but to the west of it).

In 1900, Simpson has united *alabamensis* with *conasaugaënsis*, but in 1914, he separated them again, expressly stating that the three forms are closely connected and hard to distinguish. He gives the following distribution: *conasaugaënsis*, Alabama River system; for *alabamensis* the additional locality: Shelby Co., Ala.; for *gesneri* also: Swamp Creek, Ala. (an uncertain locality, possibly Swamp Cr., Lowndes Co., Ala., trib. to Alabama River; but there is another Swamp Creek, in Escambia Co., trib. to Escambia River).

Thus these forms are found in the Alabama, Tallapoosa, and Coosa drainages, from southern central Alabama (Lowndes and Macon Cos.) northward to northern Georgia. From this region I have the following material.

Chatooga River, Trion, Chatooga Co., Ga. A dead, broken shell, A. E. Ortmann coll., May 19, 1915.

Conasauga River, Conasauga, Polk Co., Tenn. Three males, two females (with soft parts), A. E. Ortmann coll., May 24, 1915.

Coosa River, Weduska Shoals, Shelby Co., Ala. Three shells, H. H. Smith coll.

All those described shells, and also the specimens at hand, resemble the *Strophitus edentulus* (Say) of the interior basin. They differ from it, however, in the somewhat lighter color of

[1] According to the orthography accepted in the U. S. Topogr. Surv. maps I change thus the original spelling: *connasaugaensis*.

the epidermis, in that of the nacre, which varies from whitish to dull salmon or purplish (the latter color never found in *edentulus*), and chiefly by the better development of the hinge teeth. While the pseudocardinals, in *S. edentulus*, are entirely rudimentary, represented only by gentle swellings or not at all, there is, in this Alabama-form, at least one pseudocardinal in each valve, which may be small, but is generally, well developed, triangular and compressed, or tubercular, knob-like and stumpy. The tooth in the left valve corresponds to the second tooth of the original Anodontine hinge-teeth, for, in rare cases, in front and behind this, traces of a first and third tooth are seen, the third corresponding to the interdental tooth.

M. connasaugaënsis Lea, founded upon a single individual, is of medium size, and rather elevated in the posterior part; *M. alabamensis* Lea, also founded upon a single specimen, is large, and represents the normal condition of this form: it is also somewhat thicker than young shells. *M. gesneri* Lea is founded upon five specimens; the figured one also is large, but less elongated than *alabamensis*, and a little more convex, with darker (brown) epidermis: the nacre is purplish on the margins, and, according to Simpson, the left valve has traces of three pseudocardinals (Lea describes only one).

These three forms easily fall within the range of variation as indicated by my specimens (which surely belong to one species). and I only should add, that I have no specimens as large as *alabamensis* and *gesneri*. My largest, a female from Conasauga, measures: L. 67, H. 49, D. 32 mm. Also none of my specimens has purplish tints in the nacre, but in several of them salmon color is seen.

This species should be known as *Strophitus conasaugaënsis* (Lea) (1857), and it is characterized by the presence of at least one pseudocardinal in each valve, variable in size and shape, to which, in the left valve, sometimes traces of two others (anterior and posterior) are added; by the yellowish-olive color of the epidermis, turning to brown in old shells, and the occasional presence of rays upon the posterior slope.

The same type of shell, as far as it concerns the hinge-teeth, is found in the western section of the Alabama system, in Tom-

bigbee River and its tributaries in western Alabama and eastern Mississippi. These shells are larger, thicker, and more swollen and have a blackish epidermis (in young ones, however, this is lighter, yellowish to greenish olive, but mostly with dark rays and dark concentric bands). They go by the names of *St. spillmani* (Lea) (1858) and *St. tombigbeensis* (Lea) (1858). They undoubtedly represent *conasaugaënsis* in this region, but I cannot tell whether they intergrade with it or not. *S. spillmani* is a longer spell, dark brown, with concentric bands, while *S. tombigeensis* is shorter, with dark epidermis and lighter rays, characters which surely are only individual.

CORRECTION OF THE NAME OF DRILLIA ROSEOBASIS P. AND V.

BY H. A. PILSBRY AND E. G. VANATTA.

Drillia roseobasis, from Tagus Cove, Albemarle, Island, Galapagos, was defined by us in Proc. Washington Academy of Sciences IV, 1902, p. 560, pl. 35, fig. 2. We did not know that there was a prior *Pleurotoma* (*Drillia*) *roseobasis* of E. A. Smith.* Neither of these species would be a *Drillia* in the modern sense, and as genera are now understood in this family, they would probably not be considered congeneric; but Smith's species has not been figured and is little known. Dr. W. H. Dall, considering the names homonymous, renamed the Galapagos species *Pleurotoma roseotincta.*† Unfortunately, this name cannot be used on account of the prior *Pleurotoma* (*Clathurella*) *roseotincta* Montrouzier, 1872.‡ We propose, therefore to rename our Galapagos species *Pleurotoma testudinis.*

* Ann. Mag. Nat. Hist. (6), II, 1888, p. 301. Habitat unknown.

† "*Pleurotoma roseotincta* new name for *roseobasis* Pilsbry, 1902, not of E. A. Smith, 1888." Proc. U. S. Nat. Mus. vol. 54, 1919, p. 333.

‡ Journ. de Conchyl. XX, 1872, p. 361; XXI, 1873, p. 55, and as "*Pleurotoma roseotincta*," t. c. pl. iv, fig. 1.

NOTES ON A NEW CLADOHEPATIC NUDIBRANCH FROM FRIDAY HARBOR, WASHINGTON.

H. P. KJERSCHOW AGERSBORG, PH.D.,
Department of Zoology, University of Nebraska.

OLEA (*genus nov.*).

The body is truncate anteriorly, elongate, limaciform, tapering to a point posteriorly. The back is gently arched and smooth, and passes imperceptibly into the sides which are also gently arched, so that the body with the back and sides may be said to arch until they touch the foot from which they are set off. The back bears two rows of papillæ on each side located posteriorly to the middle of the body; those in the dorsal row are larger than those in the ventral; the papillæ of the latter alternate in position with those of the former. The position of the papillæ (Fig. 1) is remarkable from the fact that these organs are clustered into two rows, dorso-laterally, on the middle aspect of the body in the position similar to that of the cerata of *Doris*. The tapering posterior part of the body extends posterior to the base of the last pair of papillæ a distance equal to one-half the length of that part of the body which is anterior of the first pair of papillæ. The heart was seen pulsating just below and between the first anterior papillæ. The anal pore is on the right side, in front of the heart, near the mid-dorsal line. The genital openings are placed antero-laterally near the end of the body. There are two small pigment spots on the dorso-lateral part of the neck where the dorsal margin of the less pigmented border of the neck merges with the darker area of the back. The body is everywhere uniformly ciliated.

A radula is totally absent. There are neither tongue nor jaws.

OLEA HANSINEËNSIS (*sp. nov.*). Plate VI.

Distribution: Puget Sound (Friday Harbor), Washington.

Dimensions: The length of the largest specimen was 13 mm.; the smallest, 7 mm., and the height 2 mm. and 1 mm., respectively.

Color: *Olea hansinecensis* is dark brown in color, very much like *Haminea* Leach, of the *Tectibranchiata;* but the former is studded everywhere with lighter spots of various sizes. In the lamp-light, however, the color changed to a light yellowish brown hue. The tips of the papillæ, the back between the papillæ, the sole of the foot and its dorsal posterior part, and the sides of the head and neck, are lighter than the rest of the body.

Foot: The foot (Fig. 2) is nearly as wide as the body is high. It is convex anteriorly, with papillary prolongations of the antero-lateral angles. Posteriorly it tapers lanceolately to a point. Its surface is uniformly ciliated.

Head: The head is set off from the body by a short but distinct neck. Dorsal tentacles are absent. The oral tentacles are lateral prolongations of the hood, one on each side. Labial parts consist of a rounded lobe on each side, and one median dorsal lobe. The mouth is sub-terminal, vertical; the ventral lip bilobed.

Habitat: These very interesting animals live on the eel-grass (Zostera marina). I never have been able to distinguish them from their environments while in their native habitat because of their resemblance in color to the vegetative (filamentous diatomaceous) growth which together with hydroids fairly cover the fronds of the *Zostera;* but they were detected when brought accidentally into the laboratory along with *Hermissenda opalescens* Cooper, and *Haminea* Leach, commonly found among the eel-grass at Brown Island, Friday Harbor, Washington, in very large numbers, especially the latter. They were dipped up from the eel-grass by means of a gravy-strainer with *Hermissenda* and *Haminea.*

Nidosome: A number of nidosomes were laid in the dish in the laboratory on the second morning after capture, the animals being segregated from other nudibranchs. The nidosome is a simple coiled string (Fig. 4) from 20 to 70 mm. long and 1 mm. in diameter. Oviposition continued for three weeks. The eggs are capsulated, and there is only one egg in each capsule. Cleavage total and spiral. During oviposition the animal crawls in the direction of the arrow (Fig. 4).

Death-feigning was commonly practiced when the animals were disturbed. But they soon resumed active movements on the bottom and along the side of the dish and toward the top of the water. When the water became stale they invariably dropped to the bottom of the dish and lay motionless. This habit is contrary to that of the *Aeolidia* which seek the surface at such times and remain mostly adhering to the surface film. *Olea hansineënsis* comes to the surface when it is feeding (it is constantly nipping at nearly microscopic organisms when at the surface, crawling as it does on the surface film with the back downward) or actively crawling; it never rests on the surface film as the *Aeolidia* do: when it rests it is on the bottom, and often appears to be dead. Shaking the finger-bowl, however, awakens it from its slumber, when it again becomes active.

I am not sure of its exact systematic position until I find opportunity to examine its anatomy more carefully. The liver extends into the papillæ (Fig. 3), and on that account it is, of course, a Cladohepatic form. But the hepatic arborization is not so extensive as *e. g.,* in *Melibe leonina* (Gould), Agersborg (1916, 1919, 1921, 1922, 1923, 1923a). The head of *Olea hansineënsis* resembles that of *Limapontia nigra* Johnston, but unlike this species which has no papillæ, *O. hansineënsis* has two rows of papillæ clustered closely together posterior to the middle of the back, anterior and posterior to which it is perfectly smooth. The position of the anus and other anatomical differences, as *e. g.,* the radula, remove it from this type. The gonads are divided into a number of acini connected by a branching duct-system as in *Doto coronata* Gemlin. Another form to which its head bears resemblance in shape is *Acteonia corrugata* Ald. & Hanc. I cannot find any resemblance in *O. hansineënsis* to any of the numerous types described by Bergh (1879, 1880, 1894, 1904), Cockerell (1901, 1901a, 1902, 1908, 1915), Cockerell and Eliot (1905), Cooper (1862), Eliot (1910), Fewkes (1889), MacFarland (1905), O'Donoghue (1921), Pease (1872), and Stearns (1873). O'Donoghue, to whom I presented a specimen, writes me: " The other one (*O. hansineënsis*) is not

known to me and as far as I can find has not been recorded previously from the Pacific Coast of North America." It is quite safe to erect for this type a new genus; it may even be found to deserve family rank. The generic name, which I have proposed, is *Olea* in honor of my sister who for a number of years was a constant source of inspiration to me in my scientific studies in this country; the specific name is *hansineënsis,* in honor of my first, the noblest, and the greatest of all my teachers, my mother.

Only seven specimens in all were collected. The place of collection was from *Zostera marina* in the inner bay of Brown Island, opposite the Laboratory of the Puget Sound Biological Station at Friday Harbor, Washington. In fixing the animals, nearly all the papillæ dropped off. Two specimens, preserved in 5% formaldehyde, were dissected for the purpose of studying the radula, but no trace of such an organ was detected. Four specimens were fixed in Flemming's chromo-osmic-acetic mixture for cytological study. Of these, one is designated as the type, and remains in the collection of the writer. Dr. Chas. H. O'Donoghue, of the University of Manitoba, has one specimen which was preserved in formaldehyde.

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Explanation of Figures, Plate VI.

1. Drawing from life of *Olea hansineënsis* (*gen. et sp. nov.*), dorsal view. L, lateral labial lobe; op, oral tentacles. The eye spots are seen just caudad to the oral tentacles; the dorsal labial lobe is seen between the lateral labial lobes.
2. Drawing from life of *O. hansineënsis,* ventral view. L, lateral labial lobes; op, oral tentacles. Note the ventral labial lobe between the lateral labial lobes just cephalic to the anterior convex border of the foot.
3. Drawing of a large papilla from a preserved specimen to show the hepatic extension into the organ. The outline of the papilla is shown in the line surrounding the stippled area, the hepatic branch. Greatly enlarged.
4. Nidosome. A, beginning; b, end. The arrows indicate the track followed by the animal during oviposition. Enlarged.

EFFORTS TO ACCLIMATIZE ATLANTIC OYSTER AND SOFT CLAM IN THE HAWAIIAN ISLANDS.

BY R. A. COLEMAN,
Agent, U. S. Bureau of Fisheries, San Francisco, California.

An attempt is being made by the Hawaiian Fish and Game Commission with the cooperation of the U. S. Bureau of Fisheries to introduce two highly-prized shellfish, the Atlantic coast oyster, *Ostrea elongata,* and the soft clam, *Mya arenaria,* into Hawaiian waters. Although serious difficulties have been encountered, it is felt that there is ground for hopes of the success of this enterprise.

The first efforts were with the oyster. In May, 1921, five

* Published by permission of the United States Commissioner of Fish and Fisheries.

barrels of Long Island oysters, which had been replanted in Tomales Bay, Cal., were shipped by the U. S. Bureau of Fisheries representative in San Francisco to Mr. H. L. Kelly, Executive Officer of the Hawaiian Fish and Game Commission, Honolulu, who planted them at a site (selected in 1920 by Dr. H. F. Moore, U. S. Deputy Commissioner of Fisheries) in Pearl Harbor, Oahu. There the oysters gave every indication of thriving till they were discovered and destroyed by the native "fishermen," who work over every inch of available bottom. With the oysters sent in the second shipment, May, 1922, therefore, precautions were taken against their loss by this means.

With the clams, as with the oysters, but from an entirely different cause, the first effort at introduction failed. In May, 1922, a shipment of soft clams accompanied that of the oysters and like them was sent in the "chill room" (kept just at freezing point). Unfortunately this method, successful with the oysters, was a complete failure with the soft clams, all of which died and spoiled in transit. To avoid this sort of loss a second shipment of clams was arranged for March 7, 1923, the clams to be frozen and shipped in the "ice house," thence to be thawed under water, a method said to be applicable to this species.

The results of these attempts to ship the soft clam and to introduce both this shellfish and the Atlantic coast oyster are awaited with interest.

PUBLICATIONS RECEIVED.

NOTES ON THE MOLLUSKS OF THE COLORADO DESERT. By S. Stillman Berry. Proc. Acad. Nat. Sci. Phila. 1922, pp. 69–99; 3 plates. The introduction to this interesting paper deals with the geography, topography and other characteristics of the desert, the occurrence of land and freshwater shells, and a full bibliography. An account of species collected by Messrs. George Willett, Allyn G. Smith, J. Stanley Ferguson and the author follows: *Micrarionta aquæ-albæ* n. sp., *M. wolcottiana*

Bch., *M. xerophila* n. sp., *M. indioensis* Yates, *M. harperi* Bryant are described or discussed, with several Pupillidæ etc.—H. A. P.

The effect of low Salinity on Teredo navalis. By Harold Francis Blum, Univ. of Cal., Pub. in Zoology, vol. 22, No. 4, 1922. The work was carried on in San Francisco Bay. "The animal is normally active in salinities as low as 9 parts per 1000, and below this point the activity decreases with decrease in salinity." "Teredos obtain some protection from water of a salinity below the lethal (5 parts in 1000) by stopping the mouth of the burrow with the pallets." "A period of 33 days below 4 parts per 1000 salinity has destroyed 90 per cent of the teredos in piles at Crockett."—H. A. P.

Variations in the shell of Teredo navalis in San Francisco Bay. By Robert Cunningham Miller, Univ. of Cal., Pub. Zool. vol. 22, plates 13–17. *Teredo navalis* in San Francisco Bay exhibits an extremely wide range of variation, involving practically every feature of the shell. The more salient variations have been correllated with factors of the environment. The local varieties, including *T. beachi* Bartsch, have not been found sufficiently differentiated to warrant their being classed as subspecies, much less as species. This important study is excellently illustrated.—H. A. P.

Upper Miocene Lacustrine Mollusks from Sonoma County, California. By G. Dallas Hanna, Cal. Acad. Sci. (4), vol. 12, pp. 31–41, pl. 1–3, 1923, New species of *Nematurella*, *Sphærium*, *Pisidium*, *Lymnæa* and *Planorbis*, with various old species, are described and figured. *Nematurella* is an Old-World genus new to America; besides *N. euzona* n. sp., Hanna refers *Littorina pittsburgensis* Clark from San Pablo to this genus.

Notes on some Land Snails of the Sierra Nevada Mountains with description of a new species. By G. Dallas Hanna and Emmet Rixford. Cal. Acad. Sci. (4), vol. 12. pp. 43–50,

pl. 4, 1923. Material collected by the authors in two trips in Tuolumne, Sacramento and Calaveras Counties, Cal., is here described. *Epiphragmophora circumcarinata* was looked for but not found. *Ammonitella yatesi* Coop. was taken at the type locality, which is fully described. The shell and genitalia are figured, and the relationship with *Polygyrella* demonstrated. Both differ from *Polygyra* by the long spermathecal duct. *Polygyra penitens* n. sp. is a new species from Mormon Island in the Sacramento River, related to *P. roperi* Pils.—H. A. P.

A new species of Carychium from Vancouver Island, B. C. By G. Dallas Hanna. Same volume, pp. 51–53, fig. 1. *C. magnificum* n. sp., from Union Bay. It is 0.2 to 0.4 mm. larger than one of the type lot of *C. occidentale*, and appears to resemble that in shape and internal lamellæ.—H. A. P.

Fauna from the Eocene of Washington. By Charles E. Weaver and Katharine Van Winkle Palmer. University of Washington Publications in Geology, Vol. 1, No. 3, pp. 1–56, pls. VIII–XII, June, 1922. The paper consists chiefly of descriptions of marine mollusks from Eocene deposits of Washington but a new genus and five new freshwater species are included; to these last, special reference is here directed. The new genus, *Phaenomya*, is stated to be allied to *Corbula* and *Mya*; type species, *Phaenomya vaderensis*, n. sp. from the Eocene of Lewis County, Southern Washington.

Anodonta arnoldi (p. 14) is described without a reference to any other described species. The exterior is figured from a somewhat crushed specimen and seems to have no characters by means of which the reader can distinguish it from well known living species.

Hydrobia pontis (p. 33) is not compared with any other species, and although stated to be abundant at the same locality as the above, a fragment was chosen for figuring. The description states that the whorls are angulated medially but the figure fails to show it. This, and other discrepancies between the discription and figure make the species unrecognizable.

Goniobasis hannibali is described (p. 44) as having sculpture "extremely variable. The extreme form in sculpture has been taken for the type of the species. *Goniobasis olequahensis* (Arnold and Hannibal) represents the smooth type of shell. * * * The collection contains specimens which show transition stages between the two types of shell." The authors give other reasons why the smooth and sculptured shells are the same species. "Many shells have oblique plications on the nuclear whorls which may be absent on the body whorls." It is not understood by what reasoning the new name, *G. hannibali* was justified since only reasons for its union with a described form are given.

On the next page it is stated that Dr. H. A. Pilsbry has determined that *Ambloxis olequahensis* Arnold and Hannibal, belongs to the genus *Goniobasis*. In spite of this the authors describe *Goniobasis olequahensis*, new species, immediately below! No explanation of the remarkable system of nomenclature is given.

No type specimens were designated for the 56 new species and four new subspecies; (not 64 new species as stated on page one). The location of the described and figured specimens is not given although this has been generally adopted by most museums for many years. The measurements as given in the text disagree greatly with the statements of enlargement in the explanations of the plates in some cases, as for instance, *Lima packardi* (p. 15).

Attention is called to this paper because it is an example of loose practice which has developed in the study of paleontology in the west during the last fifteen years. If permitted to pass unnoticed, improvement in methods is not likely to be rapid. —G. Dallas Hanna, California Academy of Sciences.

NOTES.

SEPARATES.—Authors desiring reprints of their papers are requested to write the order *on the manuscript.* When given in a separate letter it is likely to be overlooked.

A bill authorizing acceptance by the Government of the $500,000 marble residence offered by Mrs. John B. Henderson as a home for Vice-Presidents was introduced January 26th by Senator Warren, Republican, Wyoming. The bill provides the residence shall be accepted as a memorial to John B. Henderson, once a Senator from Missouri, and his son, John B. Henderson 2d. Free and unconditional title by the Government is stipulated.—*Phila. Bulletin.*

Dr. Paul Ehrmann has published (S. B. Naturforsch. Ges. Leipzig, 1916–17) an appreciative biographic sketch with portrait of the late HEINRICH SIMROTH (b. 1851, d. Aug. 31, 1916). While Simroth was chiefly known as an investigator of slugs, a field where he held first place, his contributions to Bronn's *Klassen u. Ordnungen des Tierreichs* show wide knowledge of molluscan morphology. In the field of zoogeography he was the chief exponent of the "Pendulation theory," explaining animal and plant distribution and geological climates by the hypothesis of a wide swing in the earth's axis. A bibliography of his scientific writings is given.—H. A. P.

JOSEPH D. MITCHELL, known to many conchologists for his work on Texan shells some years ago, died at his home at Victoria, Texas, Feb. 27, 1922, 72 years of age. Several species of mollusks were named in his honor, such as *Scala mitchelli* Dall and *Unio mitchelli* Simpson. A short sketch by Vernon Bailey with portrait appeared in the Journal of Mammalogy for February, 1923.

PLANORBIS CALODERMA n. sp. The shell is small, rather solid, with about the shape of *Planorbis bicarinatus* Say, having

both sides concave, funnel-shaped, but the cavity of the right side is very much narrower than the left, as in that species. Whorls nearly three, rapidly enlarging, the last bluntly angular around the cavity on the left side, rounded on the right side; periphery convex, the greatest convexity near the left side. The aperture is ovate-piriform, oblique. The surface is finely striate, the striae cut by numerous but much more spaced impressed spiral lines. Cuticle buff.

Height 3.2, Diam. 5 mm., type.

Height 2.8, Diam. 5.5 mm., paratype.

Height 2.4, Diam. 5 mm., paratype.

Esmeralda, Guatemala, A. A. Hinkley, 1917. Type and two paratypes No. 45662 A. N. S. P.

This little snail was mentioned in Mr. Hinkley's list in Nautilus, October, 1920, p. 46. It appears to be a diminutive member of the *P. bicarinatus* (*antrosus*) group —H. A. Pilsbry.

Snail Killed by Weed—A specimen of *Polygyra thyroides* Say was taken at Cambridge (Dailsville), Maryland from the spiny seed capsule of a cockle-burr (*Xanthium commune*) upon which the snail had placed its foot and in attempting to withdraw into its shell, the hooked spines had pierced and successfully held the mollusk. In this position it died and was found by the writer. During rainy weather this species often crawls up weeds and small bushes. Their ability to quickly withdraw into the shell covering upon sensing danger is remarkable and often have I tried to arrest this movement but always with negative results. However, the cockle-burr with its sharp, stiff, hooked spines had no trouble in holding the venturesome yet unfortunate mollusk.—Ralph W. Jackson.

Epiphragmophora a Tree Climber—A live *Epiphragmophora fidelis* Gray, was secured by Mr. Alex. Walker from an old nest 35 ft. up in second growth fir woods at Blaine, Oregon. It was taken May 5th, 1922, and is in my collection No. 1254. The height that this specimen was found seemed to merit publication. —Ralph W. Jackson.

KJERSCHOW AGERSBORG: A NEW CLADOHEPATIC NUDIBRANCH, OLEA HANSINEËNSIS.

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